511XO

TRAINING HANDBOOK

STRATEGIC AIR COMMAND WWMCCS HARDWARE & OPERATIONAL DOCTRINE

VOLUME II

PREPARED BY: TESTING & TRAINING BRANCH
WWMCCS OPS DIVISION

SECTION - I

BASIC HARDWARE CONFIGURATIONS HONEYWELL 6000 SERIES EQUIPMENT

The purpose of this section is to present a comprehensive overview of WWMCCS Honeywell 6000 series Systems/Components located within the BJ Wing. An illustrated description of each configured system is presented to include; hardware location, positioning restrictions, modularity, cabling, unique features, PSI-ICP assignments, and software considerations. In addition peripheral control features and considerations for card readers, punches, printers, disk and tape subsystems are presented to include peripheral switching techniques via PSC 200 series switching devices. A schematic diagram, the hardware cabling, and software considerations for dual PSIA's, MPC's and Disk interface logic for possible deconfiguration requirements during degraded modes of operation.

1. MAINFRAME OVERVIEW: Figure 1-1 illustrates the basic hardware positioning and hard cable logic for all mainframe components including the Data Net 355s and High Speed Line Adaptor modules. Each mainframe bay has been assigned a logical identification number (bay #) to correlate with the descriptive comments presented in the following sub paragraphs.

.a. Bay 1 - System 1A System Control Units (SCU) AA & AB with attached memory modules (256K): The entire bay is normally assigned to System 1A, with SCU-AA connected to processor port A and SCU-AB connected to processor port-B. The bay can be configured to System 1B as a group (both A & B) or singularly. Each memory module is hard cabled to its associated SCU, i.e., Memory module AA is store A for SCU-AA and module AB is store B. This bay cannot be assigned to System II.

b. Bay 2 - System 1A and 1B Central Processor (CPU) and Input/Output Multiplexor (IOM) bay: Processor's and IOM's may be interchanged between System 1A and 1B by the use of the SCU port assignment switches and SCU store mode and size switches. System 1A or 1B may be operated as a combined dual processor, dual IOM system. or as a dual processor or dual IOM system. This bay cannot be configured to System II.

c. Bay 3 - System 1B System Control Unit (SCU) BA with attached memory modules BA and BB: Primarily connected to processor port C for System 1B, but may be configured to System 1A by activating port C switches on 1A's IOM and Processor. Memory module BA is configured to the SCU as store A and module BB as store B. This bay cannot be configured to System II.

d. BAY 4- (1) System 1B System Control Unit (SCU) BB with attached memory modules BC and BD. Primarily connected to processor port D for System 1B. May be configured to System 1A (ref. c. above). Memory module BC is configured to the SCU as store A, and memory module BD as store B.

(2) High Speed Line Adaptor (HSLA) 2B, Physically cabled to System 2 Data Net 355 2A. This HSLA contains 355-0 communications channel boards.

e. BAY 5- System 2 Input/Output Multiplexor bay. System 2 IOM-0 (2A) and IOM-1 (2B). IOM's may be interchanged within system 2, or System 2 may be operated as a single IOM system, configuring either IOM-0 or IOM-1 as the primary IOM via startup configuration. This bay cannot be configured to System 1A or 1B.

f. BAY 6- (1) System 2 Central Processor (CPU) bay. System 2 PRO-0 (2A) and PRO-1 (2B). Processor's may be interchanged within System 2, with either processor acting as the control processor. The System may use either processor as a single processor job stream via startup deck modification. This bay cannot be configured to System 1A or 1B.

(2) System 2, System Control Unit (SCU) 2A and 2B with attached memory modules. The entire SCU complex is hardwired to System 2 and connot be configured to System 1A or 1B. SCU-2A is configured to System 2 IOM's and Processor's as port-A, and SCU-2B is configured to port-B. SCU-2A has memory modules 2A and 2B configured to store A (128K), and memory modules 2E and 2F configured to store B (128K). Total core for SCU-2A is 256K. Note: for degraded modes of operation, SCU cannot be operated with 192K, must be operated with either 128K or 256K. SCU-2B has memory module 2C (64K) configured as store A and memory module 2D (64K) configured to store B.

g. BAY 7- System 1A and 1B Data Net 355's AA and BA. Each 355 is cabled via (DIA) Direct Interface Adaptor link to it's associated IOM. 355-AA to IOM-AA, PUB-27, and 355-BA to IOM-BA, Pub-28.

h. BAY 8- High Speed Line Adaptors (HSLA) 2A,AA and AB. Line adaptors are hardwired to their associated 355's via High Speed Device Adaptor (HDA) cable. HSLA's contain the necessary channel boards for remote device interface.

i. BAY 9- SYSTEM 2 DATA NET 355 Processor(ref. g. above) The 355 is cabled to IOM-0. 355-2A to IOM-2A PUB-27.

2. SAC SYSTEM 1, PLN 17 (JOB STREAMS 1A & 1B)

a. System 1 is a dual processor, dual IOM, 512K EAS/EIS upgraded H6070D WWMCCS System. Hardwired peripheral devices include; two Data Net 355's, two Micro-Programmable Controllers (disk), with 24 190 Disk storage units.IOM common Peripheral Interface (CPI) channels are cabled to three PSC-200 peripheral switches for System access to five PRT300 printers, three magnetic tape subsystems (total of seventeen

9-track drives, three 7-track drives) two card readers, two card punches, and three consoles. System 1 incorporates unique Peripheral Subsystem Interface Adapter (PSIA) cabling features to allow the system to operate as two seperate job streams each with 1 IOM, 1 processor, and 256K memory (1A & 1B). The system can be configured via startup deck configuration and mainframe/peripheral switches to operate as a minimum system with 64K memory, 1 processor, 1 IOM 1 disk subsystem and 1 tape subsystem, or as a complex system with 2 processors, 2 IOM's, 2 355's, 2 disk subsystems, 3 magnetic tape subsystems, and 512K memory. The System 1A/1B High Speed Line Adaptors contain modified board configurations to allow communication via 436M Remote Terminal Facility (RTF) link to the 4000 AAG remote terminal facility, the SATIN facility, and the EDTCC facility.

b. Split Job Stream 1A: The following sub paragraphs define the hardware configuration statistics for system 1, job stream 1A. Refer to figure 1-2 for graphic illustration of hardware considerations.

(1) Inter computer port cabling (MAINFRAME):

Component	Startup Des.	SCU Port	Component	Component Port
SCU-AA	MCT-0	Ø	IOM-AA	A
SCU-AA	MCT-0	7	PRO-AA	A
SCU-AB	MCT-1	Ø	IOM-AA	B
SCU-AB	MCT-1	7	PRO-AA	B

(2) Input-Output multiplexor PUB cabling for peripheral devices:

IOM PUB	Startup Desc.	Cabled to	Device Type/Code	Remarks
08	Disc*190	MPC-0,LA0	190 MPC-AA	Primary
09	" "	" "	" " "	XBAR Channel
10	" "	" "	" " "	XBAR Channel
11	" "	" "	" " "	XBAR Channel
12	" "	MPC-0,LA2	" " "	XBAR Channel
13	" "	" "	" " "	XBAR Channel
14	" "	" "	" " "	XBAR Channel
15	" "	" "	" " "	XBAR channel
16	TAPE*ASA9	PSC-AB sw#5	MTC-AA	Primary

IOM PUB	Startup Desc	Cabled to	Device Type/Code	Remarks
17	TAPE*ASA9	PSC-ABsw#13	MTC-BA	
18	**Not Configured**			Available
19	**Not Configured**			
20	PRINTER*300	PSC-AB sw#2	PRTR-AA	Primary
21	PRINTER*300	PSC-2A sw#1	PRTR-2A	Available
22	PRINTER*300	PSC-2A sw#12	PRTR-AC	Available
23	READER*200	PSC-AB sw#14	CRZ-2A	Primary
24	READER*200	PSC-AA sw#11	CRZ-AB	Available
25	PUNCH*200	PSC-AA sw# 9&10	CPZ-AA	Primary
26	PUNCH*200	PSC-AA sw#1&2	CPZ-2A	Available
27	355-0	DIA Interface	355-AA	Primary
28	**Not Configured**			
29	CONSOLE	PSC-AB sw#3	ACON-BB	Available
30	CONSOLE	PSC-AA sw#5	MCON=BA	Available
31	CONSOLE	PSC-AA sw#13	MCON-AA	Primary

(3) High Speed line adaptor, Board configuration:

HSLA Channel #	Type of Board	Cabled to	Normal Device Assgn
00-16	HSSM-358 (XJ)	Patch Panel	SATIN BB
01-17	HSSM-358 (XJ)	Patch Panel	EDTCC BB
02-18	HSSM-358 (XJ)	Patch Panel	4000 AAG
03-19	HSS-358 (AL)	Patch Panel	VIP786
04-20	HSS-355 (G2)	Comm Rack-PP	786/VIP
05-21	HSS-358 (AL)	Patch Panel	Hazeltine 4000
06-22	HSS-358 (AL)	Patch Panel	Hazeltine 4000
07-23	HSS-358 (AL)	Patch Panel	Hazeltine 4000
08-24	HSS-358 (AL)	Patch Panel	Hazeltine 4000
09-25	HSS-358 (AL)	Patch Panel	Hazeltine 4000
10-26	HSS-358 (AL)	Patch Panel	RLP/300
11-27	HSS-358 (AL)	Patch Panel	RLP/300
12-28	HSA-355 (F1)	Comm Rack-device	Reserved Exec.
13-29	HSA-355 (F1)	Comm Rack PP	Teletype
14-30	HSA-355 (F1)	Comm Rack PP	Teletype
15-31	HSA-355 (F1)	Comm Rack PP	Teletype

c. Split Job Stream 1B: The following sub paragraphs define the hardware configuration statistics for system 1, Job Stream 1B. Refer to figure 1-3 for a graphic illustration of hardwire considerations.

(1) Inter computer port cabling (MAINFRAMES)

IOM PUB	Startup Desc.	SCU Port	Component	Component Port
SCU-BA	MCT-0	1	IOM-BA	C
SCU-BA	MCT-0	6	PRO-BA	C
SCU-BA	MCT-1	1	IOM-BA	D
SCU-BA	MCT-1	6	PRO-BA	D

(2) Input-Output Multiplexor Port cabling for peripheral devices:

IOM-PUB	Startup Desc.	Cabled to	Device Type/Code	Remarks
08	DISC*190	MPC-0,LA0	190 MPC-BA	Primary
09	" "	" "	" " "	XBAR channel
10	" "	" "	" " "	XBAR channel
11	" "	" "	" " "	XBAR channel
12	" "	MPC-0,LA2	" " "	XBAR channel
13	" "	" "	" " "	XBAR channel
14	" "	" "	" " "	XBAR channel
15	" "	" "	" " "	XBAR channel
16	TAPE*ASA9	PSC-AB sw#5	MTC-AA	Available
17	TAPE*ASA9	PSC-AB sw#13	MTC-BA	Primary
18	TAPE*ASA9	PSC-2A sw#06	MTC-2B	Available
19	**Not configured**			
20	PRINTER*300	PSC-AB sw#2	PRTR-AA	Available
21	PRINTER*300	PSC-AA sw#7	PRTR-AB	Primary
22	PRINTER*300	PSC-2A sw#10	PRTR-2C	Available
23	READER*200	PSC-AB sw#14	CRZ-2A	Available
24	READER*200	PSC-AA sw#11	CRZ-AB	Primary
25	PUNCH*200	PSC-AA sw#10	CPZ-AA	Primary
26	**Not configured**			
27	**Not configured**			
28	355-0	DIA Interface	355-BA	Primary
29	CONSOLE	PSC-AA sw#3	ACON-BB	Available
30	CONSOLE	PSC-AA sw#13	MCON-AA	Available
31	CONSOLE	PSC-AA sw#5	MCON-BA	Primary

(3) High Speed line adaptor board configuration: Same as System 1A, reference paragraph 2.b.(3).

3. SAC System II PLN 18 (Job Stream System II)

a. System II is a dual Processor, dual IOM, 384 K EAS/EIS upgraded H6070D system. Hard wired peripheral devices include one Data Net 355, two Micro-Programmable disk controllers, with 10

DSS190A and 6 DSS190B disk units. IOM common peripheral channels are cabled to three PSC-200 peripheral switches for system access to six PRT300 printers, two magnetic tape subsystems (two 7-track drives, 10 9 track drives), two card punches, two card readers and two system consoles. The System can be configured to operate as a basic system with 64K, one IOM, Processor, System Controller, disk subsystem, card reader, magnetic tape subsystem, and master console. The system can be split as per system 1, however only one system will have a 355 Data Net configured. DSS190 disk controllers are dual cross barred between IOM's during normal operations to increase I/O response. System II operates as a single job stream and has not been split for dual job stream operations. HSLAchannel board assignments are similar to system 1 with SATIN and EDTCC communication capabilities. The RTF link is also configured for system II.

b. System II: The following sub paragraphs define the hardware configuration statistics for System II. Refer to figure 1-4 and 1-5 for a graphic illustration of hardwired considerations.

(1) Inter computer port cabling (MAINFRAME)

Component	Startup Desc.	SCU Port	Component	Component Port
SCU-2A	MCT-0	0	IOM-2A	A
SCU-2A	MCT-0	1	IOM-2B	A
SCU-2A	MCT-0	5	PRO-2A	A
SCU-2A	MCT-0	7	PRO-2B	A
SCU-2B	MCT-1	0	IOM-2A	B
SCU-2B	MCT-1	1	IOM-2B	B
SCU-2B	MCT-1	5	PRO-2A	B
SCU-2B	MCT-1	7	PRO-2B	B

(2) Input-Output Multiplexor port cabling for peripheral devices:

IOM PUB	STARTUP DESC	Cabled To	Device Type/Code	Remarks
008	DISC*190	MPC-0 LA0	190 MPC-2A	Primary
009	DISC*190	MPC-0 LA0	190 MPC-2A	XBAR channel
010	DISC*190	MPC-0 LA0	190 MPC-2A	XBAR channel
011	DISC*190	MPC-0 LA0	190 MPC-2A	XBAR channel
012	DISC*190	MPC-1 LA0	190 MPC-2B	Primary
013	DISC*190	MPC-1 LA0	190 MPC-2B	XBAR channel
014	DISC*190	MPC-1 LA0	190 MPC-2B	XBAR channel
015	DISC*190	MPC-1 LA0	190 MPC-2B	XBAR channel

IOM PUB	Startup Desc.	Cabled to	Device Type/Code	Remarks
016	TAPE*ASA9	PSC-2A sw#13	MTC-2A	Primary
017	TAPE*ASA9	PSC-2A sw#14	MTC-2A	XBAR Channel
018	TAPE*ASA9	PSC-2A sw#4	MTC-2B	Available
019	**Not Configured**			
020	PRINTER*300	PSC-AB sw#10	PRTR-2B	Primary
021	PRINTER*300	PSC-2A sw#1	PRTR-2A	Available
022	PRINTER*300	PSC-2A sw#10	PRTR-2C	Available
023	READER*200	PSC-AB sw#6	CRZ-2A	Available
024	READER*200	PSC-AB sw#9	CRZ-2B	PRIMARY
025	PUNCH*200	PSC-AA sw#9	CPZ-AA	Available
026	PUNCH*200	PSC-AA sw#2	CPZ-2A	Primary
027	355-0	DIA INTERFACE	355-2A	Primary
028	**Not Configured**			
029	CONSOLE	PSC-AB sw#11	ACON-2B	Available
030	**Not Configured**			
031	CONSOLE	PSC-2A sw#3	MCON-2A	Primary
108	DISC*190	MPC-0,LA2	190 MPC-2A	XBAR Channel
109	DISC*190	MPC-0,LA2	190 MPC-2A	XBAR Channel
110	DISC*190	MPC-0,LA2	190 MPC-2A	XBAR Channel
111	DISC*190	MPC-0,LA2	190 MPC-2A	XBAR Channel
112	DISC*190	MPC-1,LA2	190 MPC-2B	XBAR Channel
113	DISC*190	MPC-1,LA2	190 MPC-2B	XBAR Channel
114	DISC*190	MPC-1,LA2	190 MPC-2B	XBAR Channel
115	DISC*190	MPC-1,LA2	190 MPC-2B	XBAR Channel
116	TAPE*ASA9	PSC-2A sw#13	MTC-2A	XBAR Channel
117	TAPE*ASA9	PSC-2A sw#14	MTC-2A	XBAR Channel
118	TAPE*ASA9	PSC-2A sw#4	MTC-2B	XBAR Channel
119	TAPE*ASA9	PSC-2A sw#6	MTC-2B	Available
120	PRINTER*300	PSC-AB sw#10	PRTR-2B	Available
121	PRINTER*300	PSC-AA sw#7	PRTR-AB	Available
122	PRINTER*300	PSC-2A sw#9	PRTR-AC	Available
123	**NOT Configured**			
124	READER*200	PSC-AB sw#9	CRZ-2B	Available
125	PRINTER*300	PSC-AA sw#2&12	PRTR-AA	Available
126	PUNCH*200	PSC-AA sw#2	CPZ-2A	Available
127	**Not Configured**			
128	**Not Configured**			
129	CONSOLE	PSC-AB sw#11	ACON-2B	Available
130	**Not Configured**			
131	CONSOLE	PSC-2A sw#3	MCON-2A	Available

(3) High Speed Line Adapter board configuration:

(a) HSLA 2A:

HSLA Channel #	Type of Board	Cabled to	Normal Device Asgn
00-16	HSSM-358 (XJ)	Patch Panel	SATIN BB
01-17	HSSM-358 (XJ)	Patch Panel	EDTCC BB
02-18	HSSM-358 (XJ)	Patch Panel	RTF
03-19	HSS -355 (G2)	Comm Rack-PP	786/VIP
04-20	HSS -355 (G2)	Comm Rack-PP	786/VIP
05-21	HSS -355 (G2)	Comm Rack-PP	786/VIP
06-22	HSS -355 (G2)	Comm Rack-PP	786/VIP
07-23	HSS -358 (AL)	Patch Panel	RLP/300
15-31	HSA -355 (F1)	Comm Rack-PP	Teletype

(b) HSLA 2B:

00-16	HSSM-358 (XJ)	Patch Panel	SATIN BB
01-17	HSSM-358 (XJ)	Patch Panel	EDTCC BB
03-19	HSS -355 (G2)	Comm Rack-PP	Available
04-20	HSS -355 (G2)	Comm Rack-PP	786/VIP
05-21	HSS -355 (G2)	Comm Rack-PP	786/VIP
06-22	HSS -355 (G2)	Comm Rack-PP	786/VIP
07-23	HSS -355 (G2)	Comm Rack-PP	786/VIP

4. PERIPHERAL SUBSYSTEMS:

a. PSC-200 Switching Module: Three PSC-200 switching modules with a total capacity for forty-eight OPT510 control switches are configured. A total of twenty seven switches are active for operator use for switching peripherals between WWMCCS System I and II. The purpose for the PSC-200/OPT510 modules is to allow multi-system sharing of available peripheral devices. Magnetic tape controllers, card readers and punches, line printers (PRT300), and system consoles are routed through the three switching modules to allow flexible switching between job streams IA,IB and System II.

(1) There are two basic types of switch wiring within the PSC-200 switching module:

(a) SINGLE SWITCH (1 device - 2 IOMs); The single switch uses a common connection from the device to the basic input side of the OPT510 switch. A two way connection is available on the other side of the switch, which are connected to Common Peripheral channels from system IOMs.

Therefore, the device is capable of a two way switchable link between two alternate IOMs. Two way switches are wired between seperate job stream IOMs, in the case of 1A or 1B, or for two seperate IOMs on the same system (sys II). In the case of System II, most two way switches serve the purpose of allowing an alternate patch in the event of either IOM-O or IOM-1 degredation. For 1A/1B, the primary purpose is to share limited I/O devices during peak job stream workloads.

(b) DUAL SWITCH (1 device - 3 or more IOM PUBS): Multi switches use a common connection from the device to the basic input side of the OPT510 switch. One side of the two way connection on the output side of the switch is tied to the input side of a seoond OPT510 switch. Therefore, an IOM channel may be tied to the available output side of the first switch, and both output sides of the second switch. This method allows all job streams access to a single peripheral device. Both card punches are configured in this manner to allow three IOM channel inputs per device.

(2) Figure 1-5 illustrates all the operator switching capabilities of the three PSC-200 modules. Two types of markings are present on each switch face. The device type is engraved on the left side of the switch, and the System-IOM-PUB link is shown on the dual output positions of the switch. All active positions are backlighted for operator convenience. In the case of multiple switches, arrows are engraved to show the logic flow of the three way position. In all cases except printer AA, the dual switches are parallel. Figure 1-6 depicts the cable logic behind the OPT510 indicator switches for the MTC400/404, IOM links for all available tape strings.

(3) In order to complete the physical switching of a peripheral device from one system/job stream or IOM to another, system software requirements must be considered in addition to the depressing of the two or three way OPT510 switch. Disengaging an OPT510 switch on a device for which the system IOM is actively passing or receiving data will cause IOM error messages, possible lost interrupts, and may generate a fatal software condition that will result in a total system failure. Prior to switching, devices must be in an "idle" or "standby" status, and released from the losing system via the console "RLSE" verb. After the device is physically switched, the gaining system operator must assign the channel via the console "ASGN" verb. For systems with multiple job stream configurations, care must be exercised to insure that the required peripheral channel is identified within the $CONFIG section prior to switching and assignment.

b. MTC 400/404 MAGNETIC TAPE CONTROLLERS: All Systems access to magnetic tape handlers is through four magnetic tape controllers. Two of the controllers are dual channel MTC/404 series, which are attached to peripheral

switches and system II IOMs. The other controllers are single channel MTC/400 series, one assigned to System 1A and the other to System 1B.

(1) MTC HARDWIRE CONCEPTS/PSC-200 SWITCHING: The hard cabling and switching concepts for each MTC is described in the sub paragraphs below. Refer to figure 1-6 while reading the descriptive comments for each MTC.

(a) MTC-AA: This single channel controller is cabled to a two way peripheral switch to accommodate either System 1A or 1B IOM assignment. IOM connection is provided for either system 1A on PUB 16 or system 1B on PUB 16. Switching is accomplished via PSC-AB switch 5. The normal assignment is System 1A with switch 5 in the "1A-16" position.

(b) MTC-BA: This single channel tape controller is cabled to a two way peripheral switch to accommodate either System 1A or 1B IOM assignment. IOM connection is provided for either System 1A on PUB 17 or System 1B on PUB 17. Switching is accomplished via PSC-AB switch 13. The normal assignment is System 1B with switch 13 in the "1B-17" position.

(c) MTC-2A: This is a dual tape controller which is actually split into two sides, the X side and the Y side. Each side has access to all drives connected to the controller. This dual controller is cabled to two dual peripheral switches on the X and Y sides. This configuration allows for dual channel cross-barring on a single IOM or secondary IOM assignment in the event of primary IOM failure. For normal operations PSC-2A switches 13 and 14 are in the "20-16" and "20-17" position. The startup deck $CONFIG section identifies IOM-O PUB 16 as the primary string with PUB 17 serving as a cross-barred channel/ If the assignment must be moved to IOM-1, the string is renamed on IOM-1 and switches 13 and 14 must be moved to the IOM-1 positions. NOTE: For effective cross-barring, PSC-2A switches 13 and 14 must be set to the correct IOM channel for PUBs 16 and 17.

(d) MTC-2B: This dual (X/Y) controller is cabled to three, two way peripheral switches to allow independant operation of either System II IOM-O, IOM-1, or Job Stream 1B, PUB 18. This is accomplished by wiring the X side of the controller into dual peripheral switches to allow either IOM-O (SYS II) PUB 18, or IOM-1 (SYS II) PUB 18 operations, or to deactivate the X side for assignment to System 1B by use of a dead switch exit. The Y side is wired into a two way peripheral switch for assignment to either IOM-1 PUB 19 (SYS II) or System 1B Pub 18. The normal System II assignment is PSC-2A switch 5 in the DEAD position, and switch 6 in the "21-19" position. For assignment to System 1B, switch 6 must be activated to the "1B-18" position after a console "RLSE" from System II, IOM-1 PUB 19. The "DEAD" switch

prevents accidential attempts by the System to access MTC-2B through two systems. This can happen in the event that the startup deck for System II defines a tape string on IOM-0 PUB 18, with PSC-2A switch 4 in the "20-18" position, switch 5 in the switch 4 position, and switch 6 in the "1B-18" position.

c. PRT 300, CRZ/CPZ 200 PERIPHERALS: A total of six high speed 1100LPM line printers are configured. Four card readers and two card punches are configured. By the use of peripheral switching, most of the devices can be interchanged between all job stream configurations.

(1) PRT 300, CRZ/CPZ HARDWARE CONCEPTS: The inter-switch-ability for these devices is described within Figure 1-7. These devices all utilize a single channel therefore a complex discussion of XBAR techniques and secondary channel use will not be necessary. Figure 1-7 should be sufficient for all operators to gain a complete understanding of the redundant switching capability of these devices. However, it should be emphasized that for primative bootloading, BOTH the proper peripheral switch and the IOM-0 bootload switches for device type and octal address must be set prior to the INIT BOOTLOAD.

5. DISK STORAGE SUBSYSTEMS:

a. General: The Honeywell H6000 Disk Storage Subsystem (DSS) is a high capacity removable disk storage subsystem. The term "removable" refers to the physical packs themselves, being able to mount or dismount them while the system is operational. This allows multiple users to have large data bases, but not constantly utilizing hardware resources. It also allows for various or multiple job stream operating systems to be used on site with limited changeover time. The disk storage subsystem provides fast access (accomplished by the Disk Storage Control) in a medium to large capacity storage for remote access, on-line, batch, and time share processing in a medium to large data base and multiprocessing environment.

b. Disk Subsystem Functional Description: All peripheral subsystems communicate with the General Comprehensive Operating Supervisor (GCOS) through the Input/Output Multiplexer (IOM). Interfacing with the IOM and peripheral subsystems is accomplished through a Peripheral Subsystem Interface (PSI). The transfer rate of the PSI is 1.3 million characters per second. PSI's support all types of peripheral subsystems; ie. card readers, card punches, consoles, tapes, and disk.

(1) Component Functions: The DSS 190 may be configured in many different ways to meet the individual sites requirements. The modular characteristics of the MPC provides for expansion and versatility within the subsystem. The versatility of disk drives and MPC characteristics permit removal or addition of a drive without affecting the system. The following abbreviations are used within the following descriptions and in Figure 1-8.

ADE - Additional Drive Electronics.

CCA (CA) - Control Adapter.

DCA - Disk Control Adapter.

DCX - Dual Control Crossbar.

DSC - Disk Storage Control.

DSS - Disk Storage Subsystem.

DSU - Disk Storage Unit.

EDAC - Error Detection and Correction.

EDE - Extended Drive Electronics.

LA - Link Adapter.

c. Disk Storage Control: The DSC is a general purpose, register-to-register, microinstruction processor that controls and performs functions for the subsystem. The DSC (more specifically the MPC) accepts micro instructions from the IOM via the LA and uses the necessary machine instructions to the DSU's via the CA. The MPC receives "macro-type" instructions such as seek, restore, read, and write during the I/O sequence and interprets these instructions into "micro-type" instructions such as seek, forward, lower, head select, and recalibrate. The MPC also obtains status from the DSU's and returns the appropriate status to the IOM. Four ports are provided for connection to the IOM and DSU's; two LA's and two CA's. Features of the DSC are:

(1) Microprogrammable **Peripheral** Controller (MPC). The MPC contains:

(a) Operator/Maintenance panel.

(b) Blower and air filter assembly.

(c) Logic module containing the interrupt mechanism, function network, read-only store address, and read-only store output.

(d) A-C pwer panel.

(e) Power control module.

(f) Voltage regulator assemblies.

(2) Disk Control Adapter (DCA). The DCA (more commonly referred to as the CA) connects the MPC to the DSU through the Additional Drive Electronics (ADE/EDE). The DCA synchronizes, buffers, and converts information to be transferred between the MPC and the DSU's. Information is transferred by the DCA to or from only one DSU at a time. Two independent DCA's each can transfer information to or from different DSU's simultaneously. The DCA also contains the EDAC (Error Detection and Correction) module.

(3) Link Adapter (LA). The LA connects the MPC to the IOM. Each LA has two ports, providing the ability for the LA to be shared by two physical interface channels for nonsimultaneous transfer of data between the IOM and MPC. Channel switching is controlled by the MPC microprograms.

(4) Additional Drive Electronics (ADE/EDE). The ADE can drive up to four DSU's. It contains the Disk Interface (DI) and associated cabling.

(5) Data Recovery Module. This module provides data timing and contains a dual voltage regulator.

(6) Memory. Memory consists of a read/write control store, a combination read only and read/write control store, and the read/write main memory.

(7) Simultaneous Data Channel (DCH). The DCH is an additional Disk Control Adapter (DCA) and comprises:

(a) Channel Assembly (CA).

(b) Additional Drive Electronics (ADE).

(c) Data Recovery module less the dual-voltage regulator.

(8) Additional Data Channel (ADC). The ADC connects another PSI channel to the MPC and consists only of I/O cables.

(9) Disk Controller Crossbar (DCX). The DCX connects additional disk drives to a second MPC in a two controller subsystem and consists of only I/O cables.

(10) Disk Control Adapter (CCA). The CCA is used the second Disk Control Adapter (DCA) in a dual MPC configuration and comprises:

(a) Channel Assembly (CA).

(b) Data Recovery module less the dual-voltage regulator.

d. Disk Storage Unit (DSU): The disk drive utilized by the subsystem is the DSU 190A/B (DSS 191 is the software subsystem). The DSU is an electromagnetic disk drive housed in a single low-profile cabinet. The drive includes an easily acceptable chamber with a spindle for mounting the Honeywell M4050 or an equivalent disk pack. Identification of the unit number within the subsystem can be conveniently located on the operator control panel. Changing the unit designation of a DSU 190A/B must be accomplished by a field engineer. The DSU also contains the following:

(1) Disk pack rotating mechanism.

(2) Positioning mechanism which positions the read/write heads with respect to the disk recording surfaces.

(3) Cleaning brush mechanism which cleans the disk recording surface during each power-up sequence.

(4) Two ports which permit the disk drive to be connected for simultaneous dual-channel crossbar operations.

(5) D-C power supplies and power supply controls.

e. Disk Pack: The DSU 190A/B utilizes the Honeywell M4050 (or equivalent) removable disk pack. The disk pack includes:

Twelve 14-inch disks mounted on a common shaft.

One surface is a servo pre-recorded surface.

No filter is provided on the DSU 190A/B.

The disk pack can be conveniently removed for off-line storage, and may be readily remounted for on-line processing. See Figure 1-9 for general disk pack information. The DSU 190 disk pack contains 19 recording surfaces, numbered 0-18. Each recording surface has 411 concentric tracks for a total of 7809 tracks. The track on each recording surface are numbered 000-410, track 410 being the innermost track. A group of 19 tracks (the same numbered track on each of the 19 recording surfaces) comprises a cylinder. Cylinders 000-409 (7790 tracks) are for user data, system labels, tables, catalogs, alternate tracks, and other information. Cylinder 410 is reserved for T & D use only. Of the 410 cylinders available, 404 cylinders are addressable, three are reserved as alternate cylinders, and three additional cylinders are addressable to offset any tracks that are deallocated. The storage capacity of the DSU 190's is increased significantly due to the packing density of the 191 firmware, which is an upgraded version of the 190 firmware. See Figurel-10 for a DSU 190 disk pack track layout.

f. Functions of Disk Packs: Disk packs may be formatted into four types, each type is defined to perform a specific function. The pack types are as follows:

(1) Permanent pack.

(a) Label indicates STRUCT at system startup time.

(b) Mounted on a PERM spindle (not designated "RMVBL" at startup time).

(c) Contains alternate track tables.

(d) Contains **defective** LLINK directory.

(e) May contain a permanent file catalog structure of varying size.

(f) These packs are always structured and are used for the allocation of file space for one or more of the following:

1 System edit.

2 Sysout file space.

3 Permanent files.

4 Temporary files.

(g) Permanent packs may be created at system startup time by use of the INIT and/or FORMAT functions, or previously by means of the Removable Storage Initialization Program (RSIP).

(2) Structured removable packs.

(a) Label indicates STRUCT at system startup time.

(b) Mounted on a spindle designated RMVBL at system startup time.

(c) Structured removable packs are treated by the subsystem like structured permanent packs if an in-core LLINK table had been successfully built; but if the in-core LLINK table could not be built they are treated like nonstructured removable packs.

(d) Structured removable packs may be created at system **STARTUP** or RSIP like permanent packs if the drive is defined in the INIT section of the startup deck.

(3) Nonstructured removable packs.

(a) Label indicates NSTRUC.

(b) Mounted on spindle designated RMVBL at startup time.

(c) Contains alternate track tables.

(d) May or may not contain an Available Space Table.

(e) May or may not contain a permanent file catalog structure.

(f) May be created at system startup time with the INIT and/or FORMAT functions, provided a drive is defined in the INIT section of the startup deck.

(g) This pack type may also be created by RSIP in which case there are no device LLINK tables.

(h) Packs are allocated in their entirety except the label and alternate track area.

(4) Stranger packs.

(a) A pack about which the system knows nothing.

(b) May or may not contain a label, alternate track table, and/or permanent file catalog structure.

(c) Allocated in its entirety as temporary files.

g. DSS Subsystem Operator Interface: The primary controls and indicators on the MPC of interest to the operator are: (See Figure 1-11.)

INITIALIZE - Pressing this switch lights the HALTED indicator and resets the MPC to the initialized state.

START - Pressing this when the MPC is in the HALTED state changes the MPC from the TROUBLE to the READY state.

BRANCH & RESET - Branches to the DSS 190 Firmware and presets conditions within the memory of the MPC.

ADDRESS/SIMULATE - These four thumbwheel switches are used in conjunction with the OPERATOR INTERRUPT switch to permit the user to address various functions of the MPC.

INT/EXT/CONT STORE - This three-way split-field indicator lights red in an individual field when an error is detected. Pressing this switch or executing the error option of the microprogram should reset the error and turn off the indicator field. If the error persists, notify a field engineer.

MICROPROGRAM READABLE SWITCHES (0-15) - See Figure 1-12.

(1) If the INT/EXT/CONT STORE indicators illuminate during operation, the operator may attempt to clear the condition by depressing INITIALIZE, BRANCH & RESET, and START and/or INITIALIZE and START. Normally the HALTED and TROUBLE indicators will illuminate also.

(2) Whenever a disk drive exchange is made, the operator should depress INITIALIZE, BRANCH & RESET, and START. The INITIALIZE swithc resets the MPC to the initialized state and START puts the MPC in a ready state. When the BRANCH & RESET pushbutton is depressed, the MPC control program branches to the address indicated on the ADDRESS/SIMULATE swithces. Address "0484" (hexidecimal) will perform the Basic Logic Test and device checking. Location "0484" is the normal setting of these switches and should not be changed while the MPC is in operation. If the microprograms are sensing these swithces and the operator changes them, an error could result.

(3) When the device numbers have been manually changed it is necessary to branch to location "0484" in order for the MPC to detect the new device number and location, and update its tables.

(4) It should be noted that depressing BRANCH & RESET on the MPC device that is connected to ST1, will cause a system failure.

(5) The "Microprogram Readable" swithces are critical in that they set up configuration and testing parameters for the MPC.

(6) Any failure of a component affecting the Disk Subsystem should be considered CRITICAL.

h. Disk Major/Substatus: When the exception processor detects an error on disk, a message is output on the console for operator action. Figure 1-16 lists the codes for the DSS 191. Messages on the console are in acronym or octal form or combination of the two.

i. DSS 190 MICRO-PROGRAMMABLE CONTROLLERS: All disk file units must be controlled by a Micro-Programmable Controller (MPC), WWMCCS 6000 series systems utilize four MPC's for the control of disk I/O. A total of forty disk units are connected to these controllers. All MPC's are dual configured, capable of single IOM multi PSIA channel operation or multiple IOM dual cross bar control.

(1) IOM/MPC HARDWARE CONCEPTS: The hardware cabling and channel access concepts for each MPC is described within the subparagraph below, refer to Figures 1-13 (190 MPC's) while reading the descriptive comments for each MPC.

(a) System 1A, 190 MPC-AA: A dual MPC with eight channel PSIA PUB input (single IOM). PUB's 08,09,10 and 11 are configured to LA0 (PSI-0), and PUB's 12,13,14 and 15 to LA1 (PSI-2). The primary bootload channel is PUB 08, and the XBAR scheme is IOM-0 PUB-08,12,09,13,10,14,11,15.

(b) System 1B, 190 MPC-BA: Utilizes an identical configuration scheme as 1A above.

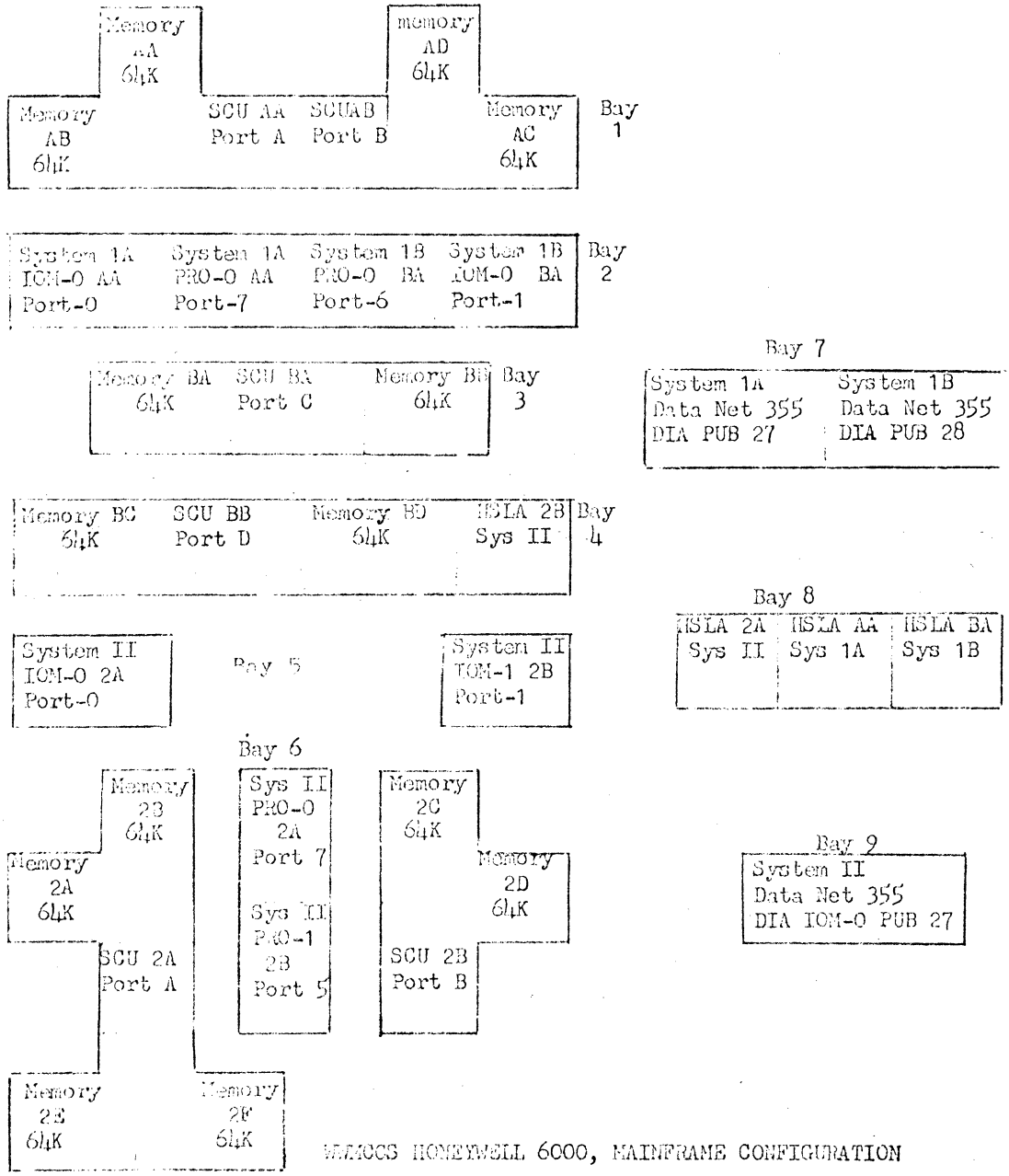
(c) System II, 190 MPC-2A: A dual MPC with eight PSIA channel input (dual IOM). IOM-0 PUB's 08,09,10 and 11 are configured to LA0 (PSI-0) and IOM-1 PUB's 08,09,10,11 are configured to LA1 (PSI-2). The primary firmware bootload channel is IOM-0 PUB 08, and the XBAR scheme is IOM-0 08,IOM-1 12,IOM-0 09, IOM-1 13,IOM-0 10,IOM-1 14, IOM-0 11, IOM-1 15.

(d) System II, 190 MPC-2B: A dual MPC with eight PSIA channel input (dual IOM). IOM-0 PUB's 12,13,14, and 15 are configured to LA0 (PSI-0) and IOM-1 PUB's 12,13,14,15 are configured to LA1 (PSI-2). The primary firmware bootload channel is IOM-0 PUB 12, and the XBAR scheme is IOM-0 12, IOM-1 08, IOM-0 13, IOM-1 09, IOM-0 14, IOM-1 10, IOM-0 15, IOM-1 11.

(2) For MPC software considerations the $CONFIG section must define every bootload PUB by disk type and number of units. Each MPC must be identified by the use of a $MPC card which must contain as a minimun, the MPC size, channel configuration, and link adaptors used (i.e., single or dual PSI). A $XBAR card must be used to identify all secondary disk channels configured. ALL $XBAR cards must define the primary bootload channel FIRST on the card, then identify all secondary channels by access priority. An additional card type, $MPCFIG, must be used to identify the firmware type and version for each bootload channel.

(3) All MPC's are controlled by internal firmware resident within a 4K memory unit. This firmware is loaded at startup and may be partially destroyed whenever an MPC experiences a trouble condition or is powered off. Figure 1-15 depicts the standard 190 MPC configuration panel and identifies swithc positioning and basic MPC restart procedures. Figure 1-16 gives operators a reference table for all DSS 190/191 Major/Substatus codes.

(RESERVED)



MAIOCS HONEYWELL 6000, MAINFRAME CONFIGURATION

Figure 1-1

HONEYWELL 6000 SYSTEM 1
JOB STREAM 1A, PRIMARY
CONFIGURATION

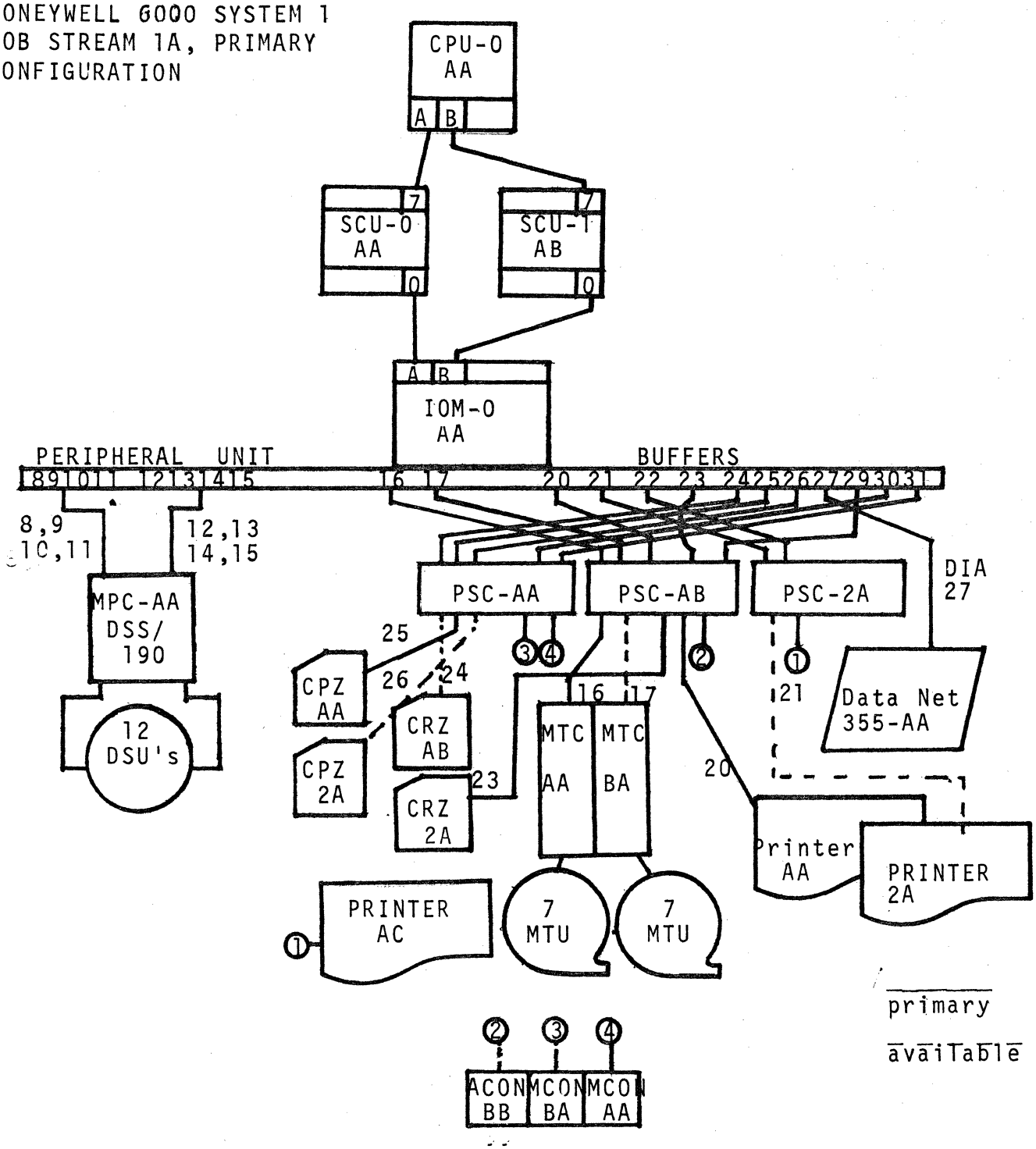


Figure 1-2

HONEYWELL 6000 SYSTEM 1
JOB STREAM 1B PRIMARY
CONFIGURATION

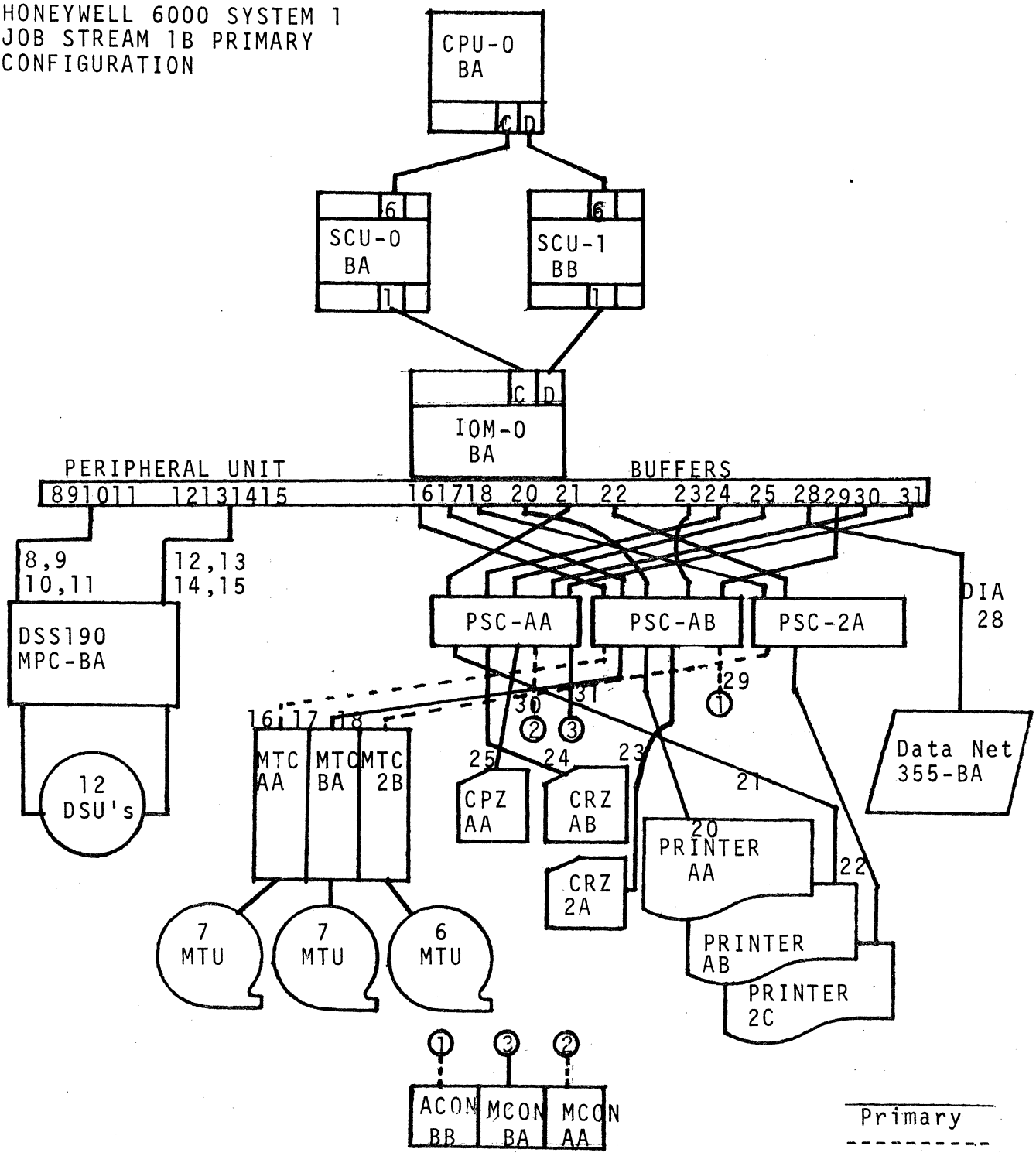


Figure 1-3

HONEYWELL 6000 SYSTEM II

PRIMARY CONFIGURATION

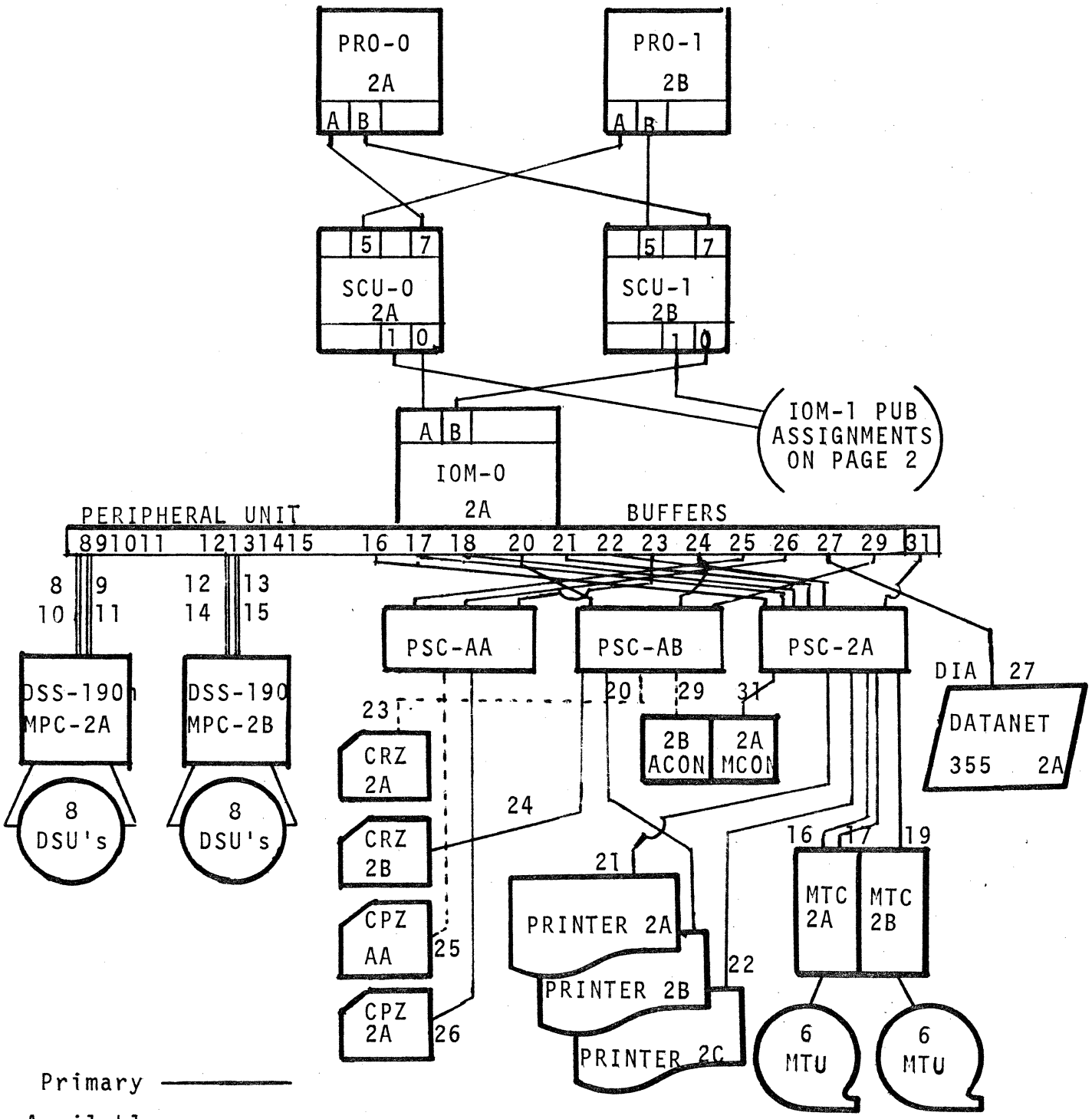


Figure 1-4

1 of 2

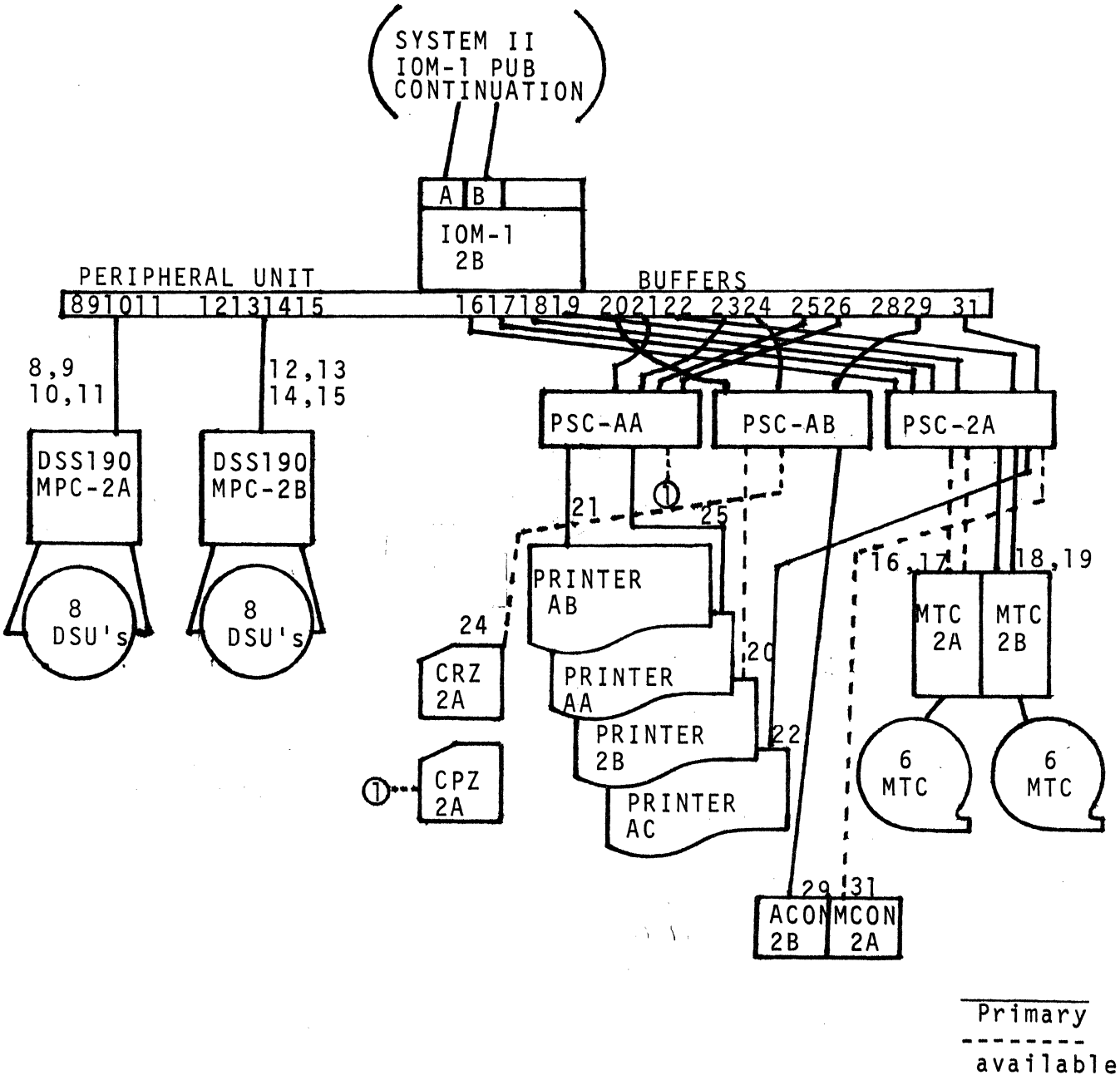


Figure 1-4

2 of 2

OPERATOR SWITCHING CAPABILITIES

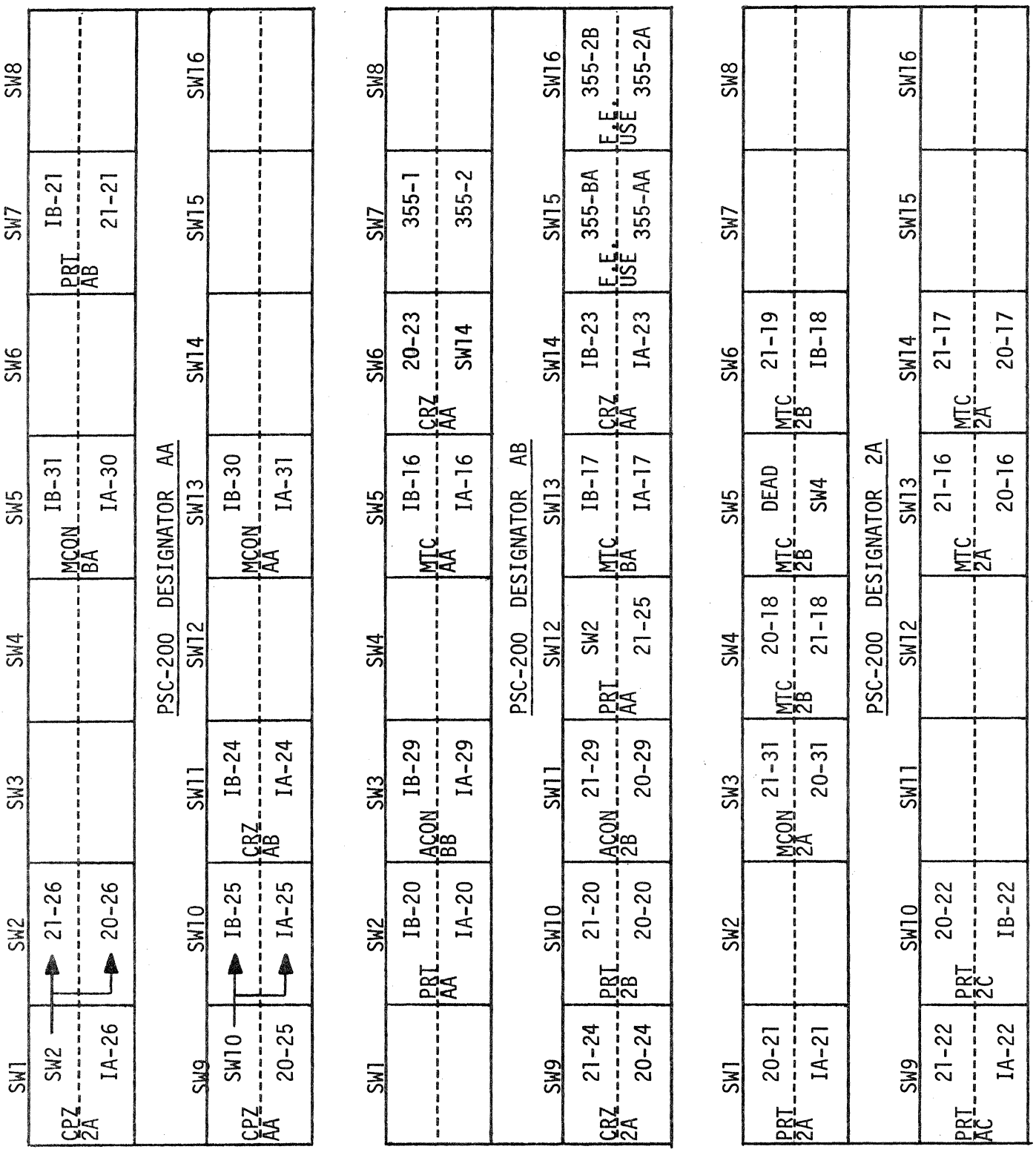


Figure 1-5

COMPLEX IOM/PSC/MTC

PERIPHERAL SWITCHING

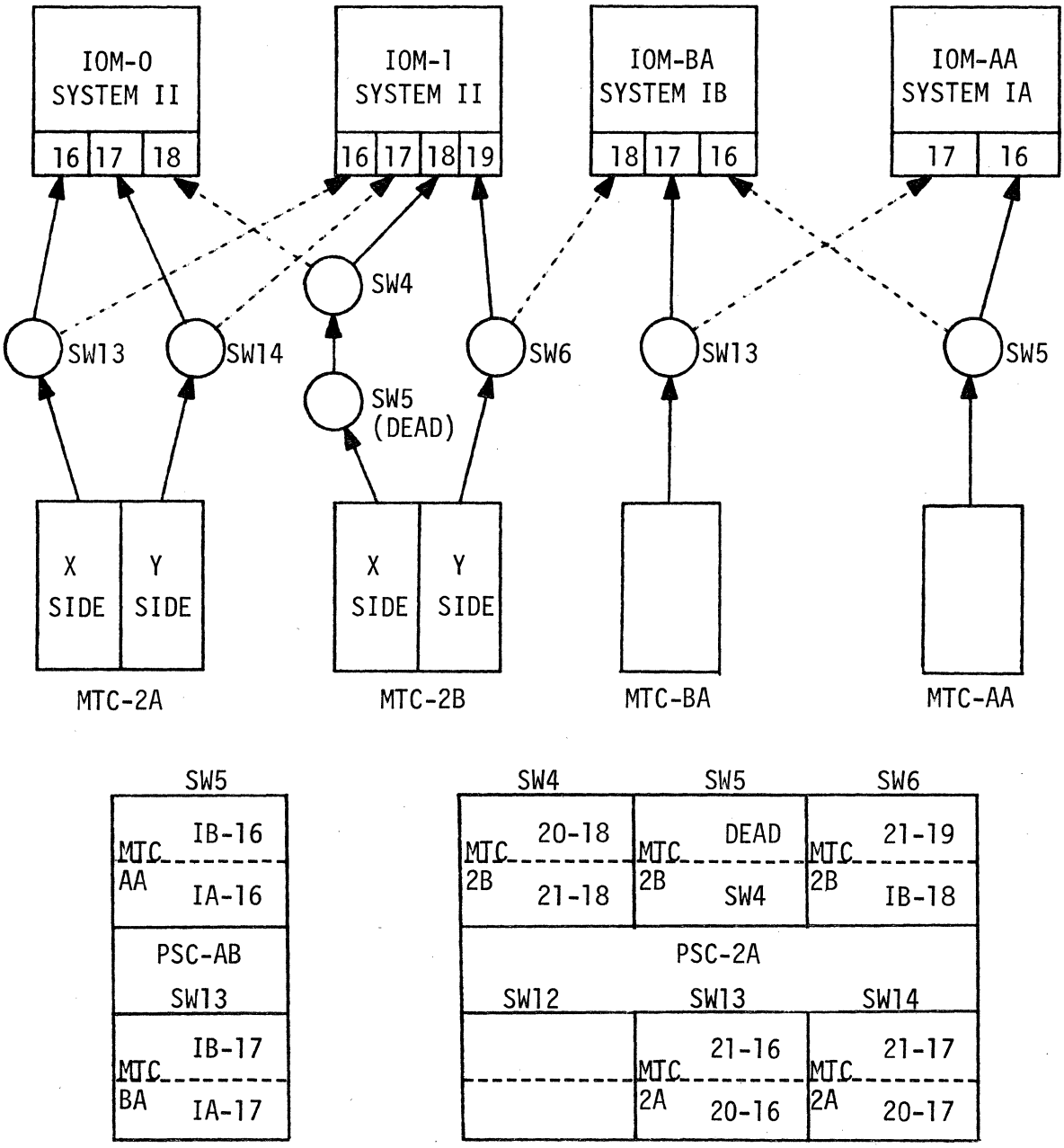


Figure 1-6

PERIPHERAL UNIT ASSIGNMENTS

PRI/ALT PRINTER, READER/PUNCH, CONSOLE

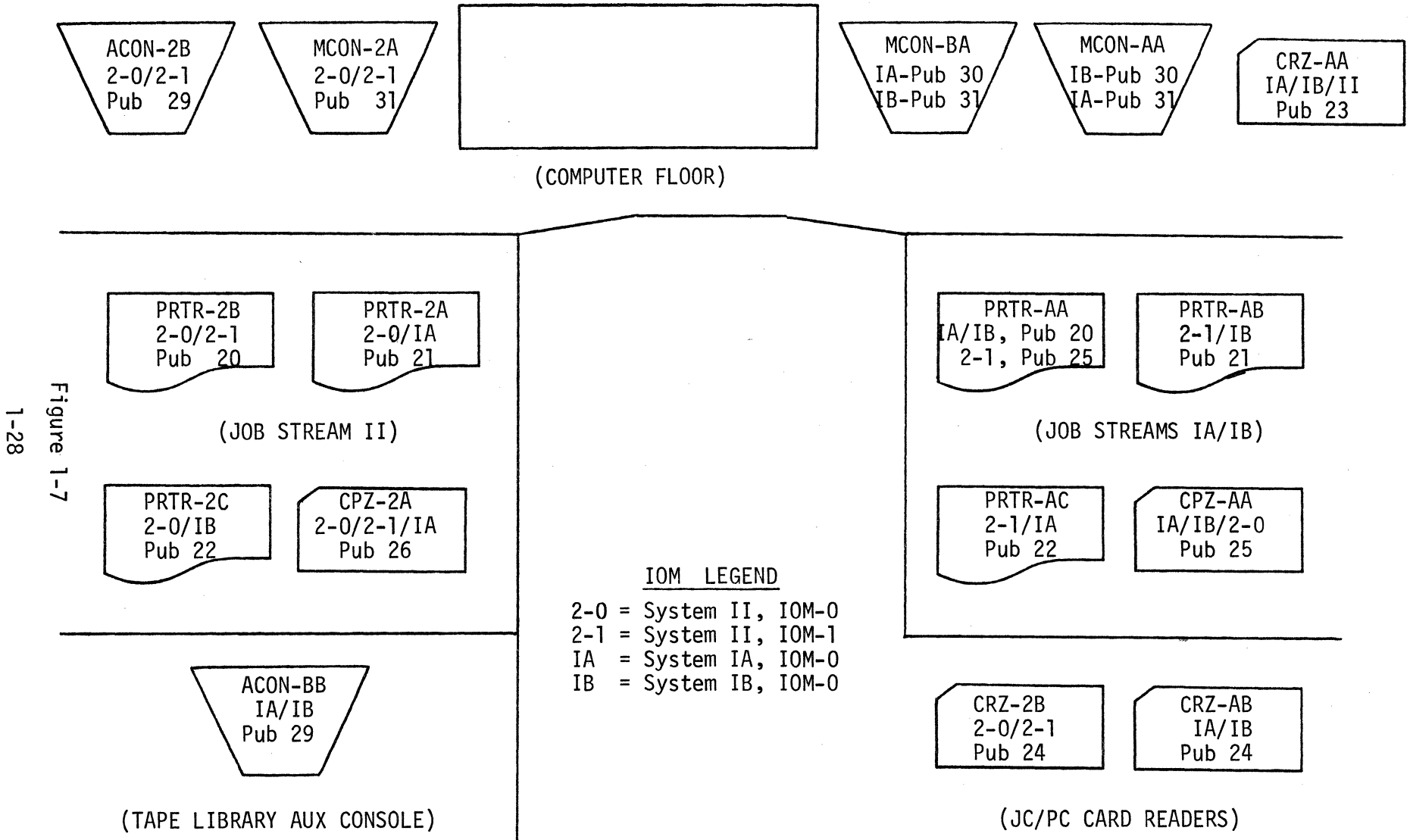
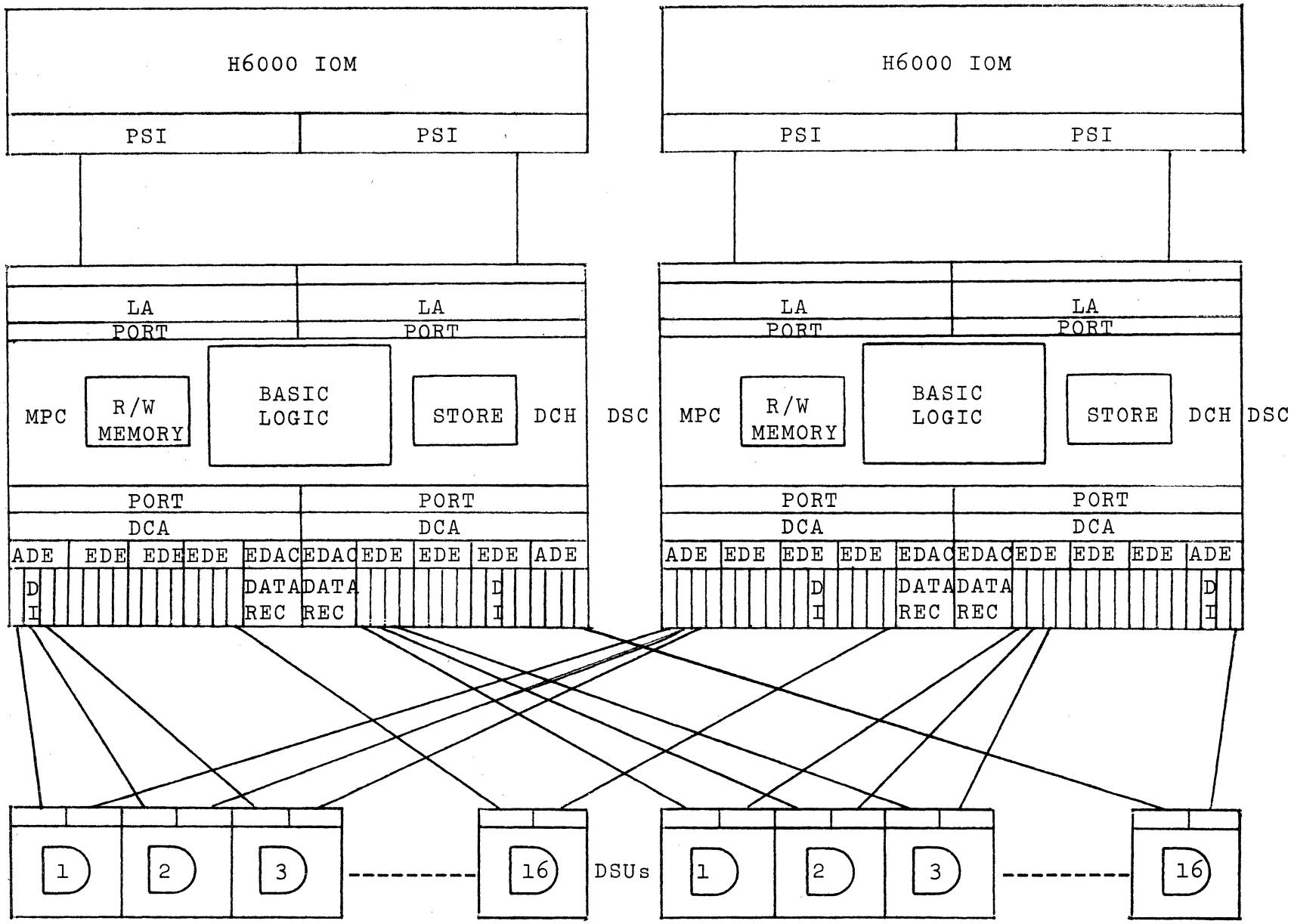


Figure 1-7



DUAL CONTROLLER CROSSBARRED SUBSYSTEM

Figure 1-8

GENERAL DISK PACK INFORMATION

	DSS 191 - DSU 190A/B
PHYSICAL DISK DIMENSIONS	14 inches in diameter
NUMBER OF DISKS	
Number	12
Storage Surfaces	19
Servo Surfaces	1
Spacing	0.4 inches apart
WEIGHT	20 pounds
OPERATING ENVIRONMENT	
Temperature	62 - 89.6 F.
Humidity	20% - 80%
STORAGE CAPACITY (6-Bit Char.)	DSS 191 - 117,903,360
SPINDLE ROTATION	3600 RPM
RECORDING DENSITY	
Outer Track	2684 bpi
Inner Track	4040 bpi
DISK LATENCY TIME	
(Average)	8.3 milliseconds
HEAD POSITIONING TIMES	
Minimum	10 milliseconds
Average	30 milliseconds
Maximum	55 milliseconds
TRANSFER RATE	
Characters per Second	1,074,000
Bytes per Second	806,000

Figure 1-9

DSS 190

DISK PACK TRACK LAYOUT

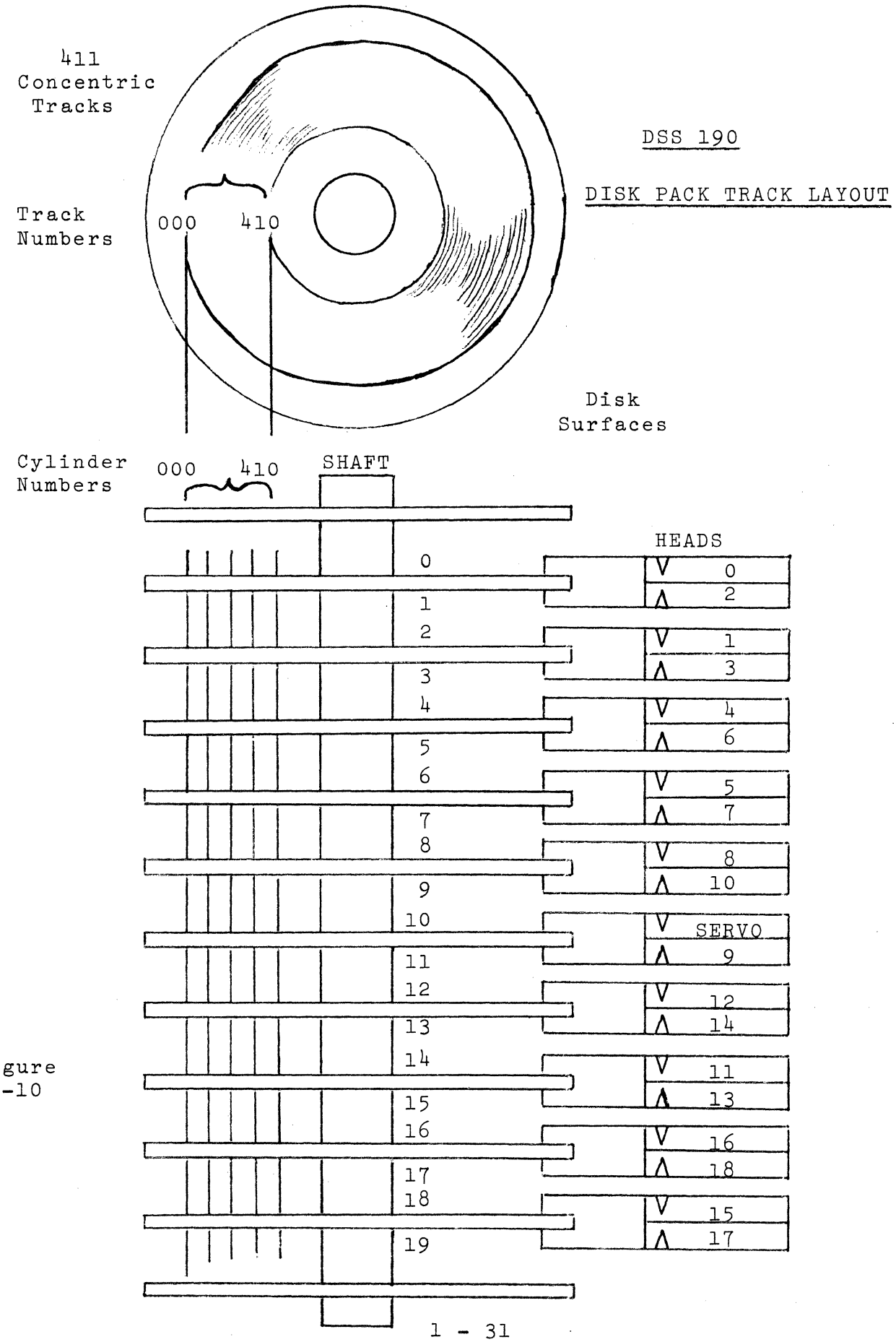
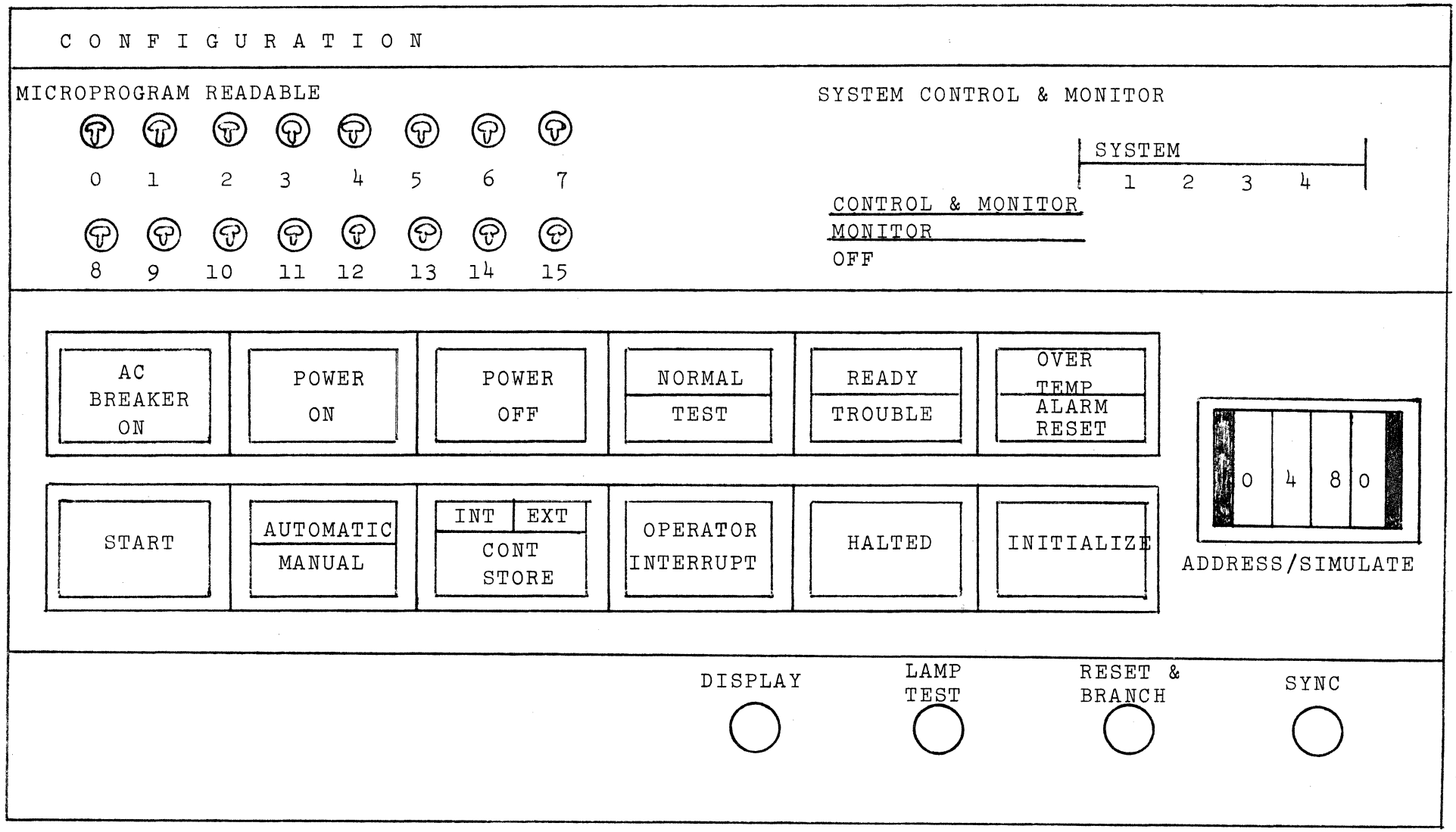


Figure
1-10



MPC OPERATING CONTROLS & INDICATORS

Figure 1-11

DSS 190 MICROPROGRAM READABLE SWITCHES

SWITCH	FUNCTION	SETTING	SAC NORMAL SETTING
0	Bypass Basic Logic Test (BLT)	0 - Perform BLT 1 - Bypass BLT	1
1	BLT Loop Control	0 - No Loop 1 - Loop on BLT	0
2	LA (for Boot)	0 - LA-0 1 - LA-1	0
3	Number of LA's in Subsystem	0 - 1 LA 1 - 2 LA's	1
4	Inhibit Entry into Trace Table	0 - Enabled 1 - Inhibit	0
5,6,7	Not Applicable		0,0,0
8,9,10	Controller Configuration		0,0,1

SWITCHES 8	9	10	CONFIGURATION
0	0	0	Disk Non-crossbar
0	0	1	Disk Crossbar
1	0	0	Disk & Disk

11	EDAC (Error Detection and Correction)	0 - EDAC Enabled 1 - EDAC off		0
12,13	Main Memory Size	SWITCHES 12	13	SIZE	0,0
		0	0	2K	
		0	1	4K	
		1	0	6K	
		1	1	8K	
14	Bypass Error Interrupt	0 - Bypass 1 - ITR Test			0
15	Not Applicable				0

NOTE: 0 - Switch Down
1 - Switch Up

Figure 1-12

WWMCCS SYSTEM 1 (1A or 1B)
DISK CONFIGURATION

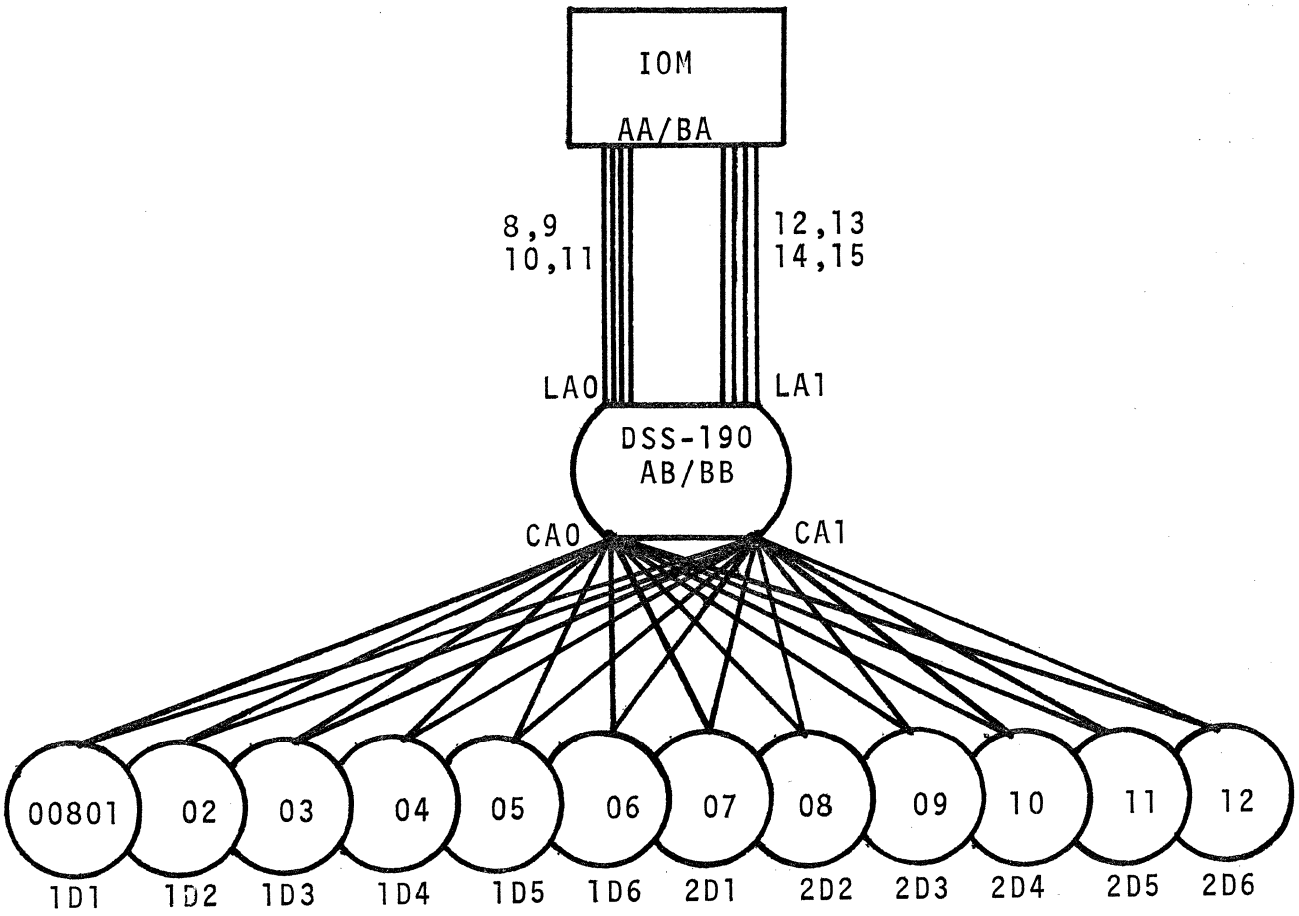


Figure 1-13

WWMCCS SYSTEM II
DISK CONFIGURATION

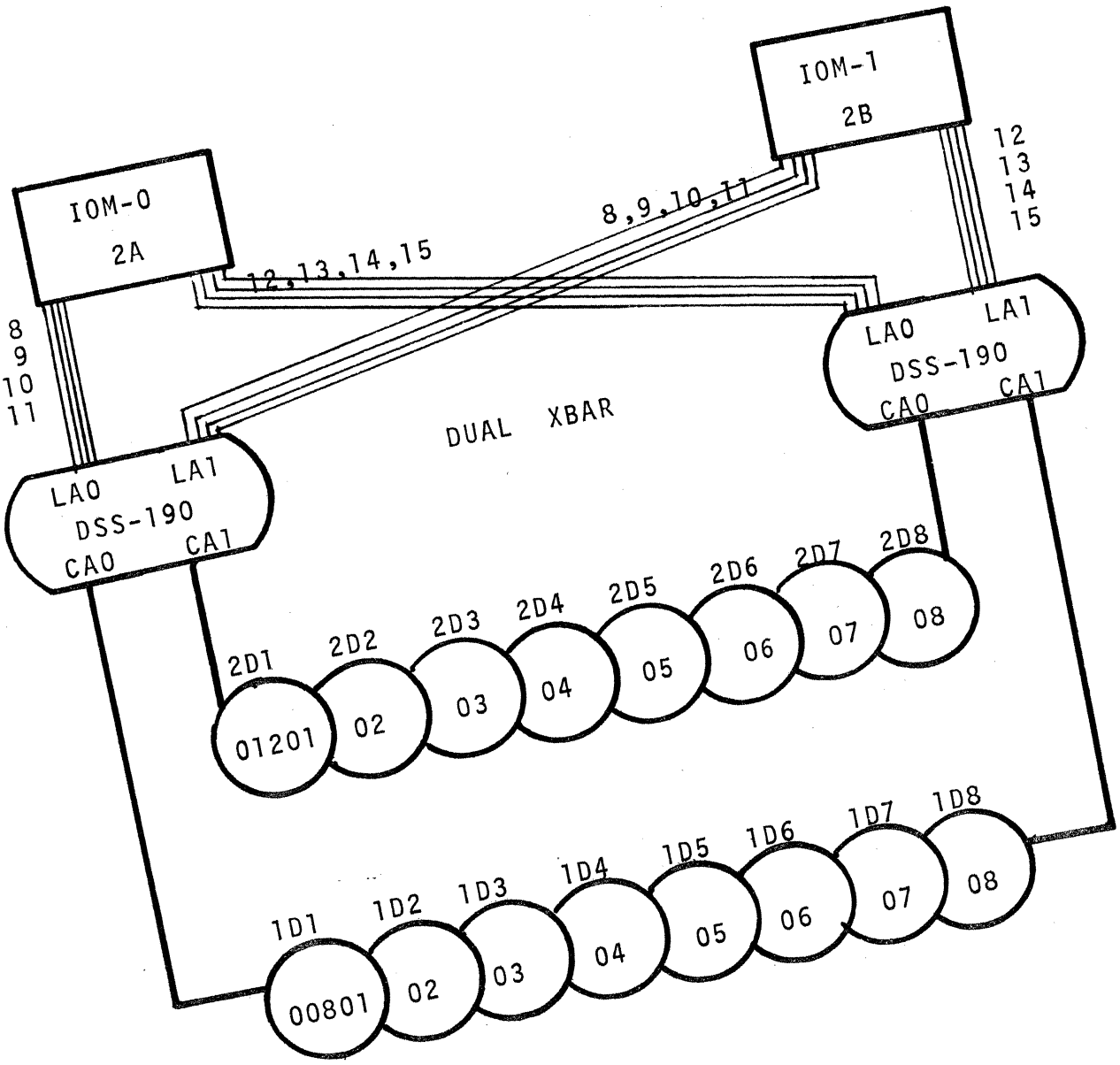
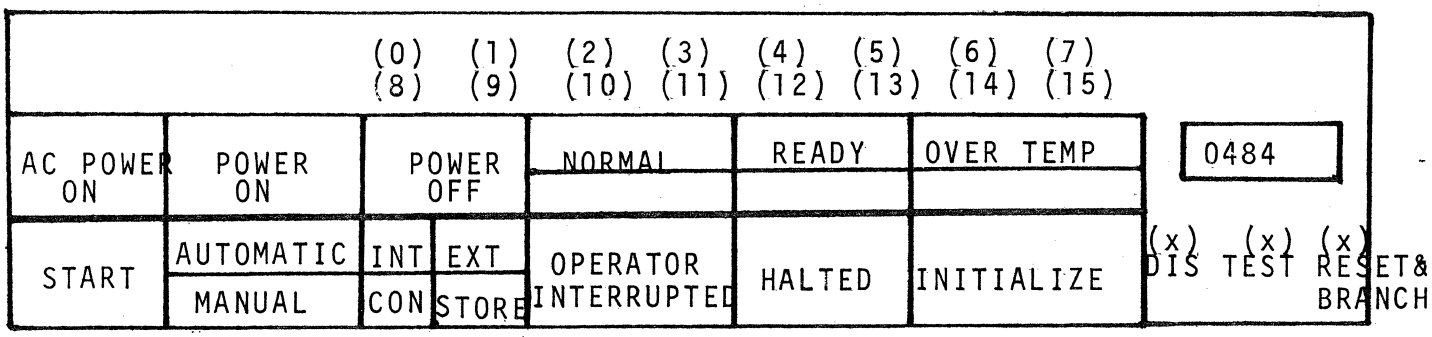


Figure 1-14

MPC CONFIGURATION SWITCHES
& STARTUP SEQUENCE



NORMAL MPC SWITCH SETTINGS

"SWITCH"

0	BLT CHECK, ON. SET IN UP POSITION
2	BOOTLOAD PORT, SET TO BOOTLOAD PUB SIDE.
3	NO. OF LINK ADAPTORS. UP IF MPC FULLY CONFIGURED, DOWN IF ONE SIDE OF MPC DECONFIGURED.
10	CAE INTERFACE UP
11	DOWN under release 6.x

NORMAL OPERATION LIGHTS

POWER ON, NORMAL, READY, AUTOMATIC.

INDICATES MAJOR MPC PROBLEM

AC POWER OFF, MPC POWER OFF(DC), OVER TEMP, TROUBLE LIGHT WITH HALTED INDICATOR.

PROCEDURE FOR INITIALIZING MPC

(1) PUT IN TEST, (2) DEPRESS INITIALIZE, (3) DEPRESS START (4) PUT BLT SWITCH DOWN (5) PRESS RESET & BRANCH (insure dial 0484 above), (6) PUT BLT BACK UP **, (7) PUT MPC IN NORMAL

**FOR 6.X BOOTLOAD, LEAVE BLT DOWN UNTIL FIRMWARE BOOTLOADED

Figure 1-15

DSS 190/191 MAJOR/SUBSTATUS CODES

STATUS	CODE
CHANNEL READY	0000
No Substatus	000000
Retrys	0000XX
Device in T & D	0010XX
DEVICE BUSY	0001
Device Positioning	000000
Alternate Channel in Control	100000
ATTENTION	0010
Write Inhibit	000001
Seek Incomplete	000010
Device Inoperable	001000
Device in Standby	010000
Device Off-Line	100000
DATA ALERT	0011
Transfer Timing Alert	000001
Transmission Parity Alert	000010
Invalid Seek Address	000100
Header Verification Failure	0X1000
Check Character Alert	X1X000
Compare Alert	1X0000
END OF FILE	0100
Good Track Detected	000000
Last Consecutive Block	0000X1
Block Count Limit	00001X
Defective Track, Alter. Assigned	000100
Defective Track, No Alter. Assigned	001000
Alternate Track Detected	010000
INSTRUCTION REJECTED	0101
Invalid Operation Code	000001
Invalid Device Code	000010
Parity Alert on IDCW	000100
Invalid Instruction Sequence	001000

Figure 1-16
1 of 2

DSS 190/191 MAJOR/SUBSTATUS CODES

(Continued)

STATUS	CODE
MPC DEVICE ATTENTION	1010
Configuration Error	000001
Multiple Devices	000010
Device Number Error	000011
CA Error	001011
Alert EN-1	001100
CA EN-1 Error	001101
CA Alert No EN-1	001110
MPC DEVICE DATA ALERT	1011
Transmission Parity Error	000001
Inconsistant Command	000010
Checksum Error	000011
Byte Lockout	000100
EDAC Parity Error	001110
Sector Size Error	010001
Nonstandard Sector Size	010010
Search Alert "First"	010011
Cyclic Code Error "Not First"	010100
Search Alert "Not First"	010101
Sync Byte Error	010110
Alternate Track Error	010111
EDAC Corr. - Last Sector	011001
EDAC Corr. - Not Last Sector	011010
EDAC Corr. - Block Count Limit	011011
EDAC Uncorrectable	011100
EDAC Corr. - Short Block	011101
MPC COMMAND REJECT	1101
Illegal Procedure	000001
Illegal Logical Channel Number	000010
Illegal Suspend	000011
Continue Bit Not Set	000100

Figure 1-16
2 of 2

a. Main Distribution Frame (MDF). The MDF illustrated in Figure 2-3 is the main switching and electrical routing assembly in the 436M Integration Segment. All currently available subchannels from the DataNet 355s are cabled to the Digital Patch Panel in the MDF. All Remote Terminals (CRTS and Teletypes) are cabled into "A" type jacks in the MDF Digital Patch Panel. Eight Digital Data Sets (DDS) are mounted in the MDF; six wired on-line, one cabled-inspare and one alternate spare not connected. The equipment sides of the connected DDSs are connected to "A" type patch jacks in the DPP. The line sides of these DDSs are connected to "normal thru" patch jacks in the Audio Patch Panel (APP). To be utilized, on-line, the alternate spare Digital Data Set must be physically recabled to the appropriate circuit The data link lines coming from the Audio Patch Panel are cabled to the Digital Data Sets in the SATIN and EDTCC and the Red side of the KG-34 crypto sets in BJ4A.

The above junctions in the MDF allow a wide variety of connections to be made between the subchannels from the Data Net 355s and the Remote Terminals, Digital Data Sets and data links from other computer facilities.

(1) Digital Patch Panel (DPP): Figure 2-3 shows a representative panel section for both "A" and "B" type patches. The "A" type patch jack is a "normal thru" circuit connected to terminator resistors on the disconnect side. All Remote Terminals and Digital Data Set lines are terminated in this manner when not patched into a Data Net 355 port. The "B" type patch jack schematic is shown in Figure 2-3. All subchannels coming from the Data Net 355s are connected to this type of jack.

Patches are made from the appropriate "B"type patch jack to the appropriate "A" type patch jack to complete a circuit between a Data Net 355 subchannel and equipments. EDTCC and SATIN patches connect the DN-355 high speed and broad band subchannels to the equipment side of Digital Data Sets. The RTF patch connects a broad band DN-355 subchannel to the RED side of a KG-34 crypto unit. This line goes from the DPP directly to the Audio Patch Panel where a "normal thru"connection busses the data stream to KG-34 number 1. Figure 2-4 maps the Digital Patch Panel. It should be noted that the primary and secondary "B" type patch jacks are usually located directly below the associated "A" type patch jack, with few exceptions.

(2) Audio Patch Panel (APP): The MDF includes an Audio Patch Panel which is associated with the line side of Digital Data Sets and the RED side of the KG-34 cryptos. The Audio Patch Panel (APP) has the capability of patching the line side of the DDS's into any of the lines linking with the major systems (EDTCC and SATIN). Figure 2-5 illustrates the front panel of the APP. The APP makes the line side of the DDS available to the operator.

The Audio Patch allows the operator to patch the SATIN and EDTCC lines to the 28.4 Kbps or 4.8 Kbps data sets and to select one of two KG-34 crypto units which communicate with the 4000th AAG Remote Terminal Facilities. The APP is designed to provide normal throughput for the transmit and receive line signals of the primary data sets and KG-34s. Patching is only performed to break the normal throughput connections and provide alternate KG-34 or data set line configurations.

(3) Digital Data Sets (DDS): The DDSs are baseband synchronous modems. The DDSs perform the conversion between those signals required for the connected equipment and a line data signal with long line capability. All external signals conform to the los level/standard interface requirements of MIL-STD-188C.

The 436M Integration Segment utilizes two different data set models which operate at different frequencies. The model 438R transmits and receives at a frequency of 34.8Kbps while the model 210R operates at a frequency of 4.8 Kbps. The model 438R is termed "broad band" while the model 210R is termed "high speed". Both models have the capability of communicating over a line up to 4.5 miles in length. Sixteen total DDSs are utilized in the 436M, 14 active units and two spares. The two spare units are mounted in the MDF. One of the spare units is cabled into Digital and Audio Patch Panels. The alternate spare has no circuit connections and would require recabling to become active.

b. Remote Indicator Panel (RIP): The RIP, located in WWMCCS console unit 3, is designed to provide the WWMCCS operator with a visual indication for each patch made on the Digital Patch Panel when a Digital Data Set (DDS) is connected to, or disconnected from, a Data Net 355 port.

The RIP, illustrated in Figure 2-6, is a standard equipment rack panel 19" wide and 5-$\frac{1}{4}$" high. Mounted on the front of the RIP are 40 indicator lamps arranged in 8 vertical columns of 5 lamps each. Each vertical column displays the connection status of one of 8 DDSs.

c. RTF Equipment encolsure and Digital Patch: The RTF patch panel allows digital patching for the Remote indicator panel, and tying the RTS link to the alternate KG-34B. The normal through connect is the KG-34B #1.

d. KG-34 Crypto Sets: Two KG-34 crypto sets are provided to encrypt the data line to the 4000th AAG. Encrypting is accomplished by encoding two tray type permuter cards with the current days crypto code. Procedures for permuter changes and crypto link-up are containted with KAO-137C/TSEC (Classified).

e. (IDF) Intermediate Distribution Frame: Secondary 436M switching distribution box located within the upper floor underground (501- Ulevel), there are no switches or patches for operator intervention.

5. Honeywell (HSLA) Interface:

a. All communications via remote computer/peripheral devices are transmitted through the HSLAs to the MDF patch panel then to the appropriate terminal device. Various types of terminal devices must receive data inputs at different signal rates. Therefore, there are four different types of channel boards that are configured in a 355 HSLA.

(1) HSA 355 (f1); KSR 33/35 Teletype interface board.

(2) HSS 355 (G2) 786/VIP, SATIN H.S., HAZ-4000, RLP-300 interface board, must be used with a CV188C EIA-Mil Standard converter. (Comm Rack)

(3) HSS 358 (AL) Same devices as above except CV-188C converter. not required, board has built in EIA-Mil standard converter.

(4) HSSM 358 (XJ) special 38.4 Kbps interface board for SATIN Broad Band, EDTCC Broad Band interface.

b. Each HSLA port must be configured via a 355 software boot load deck (spawn file) identifying the proper device type, data rate, and terminal code for each sub channel. Therefore, channels configured as 786/VIP cannot be patched via the MDF to RLP or Hazeltine devices. The boot load of the Data Net 355 is usually accomplished immediately after job stream start up. See figure 2-9 for a sample listing of a 355 software boot load configuration.

6. Patching Operations.

a. The patch panel is color coded by devices (Type A) and HSLA port (Type B) for patching convenience. I. E. Teletype devices and HSLA ports are coded blue to identify hardware/software patching compatability.

b. Any "like port" may be patched into any "like device" that is software (355 boot deck) compatable. Light/dark green devices and ports may be cross patched only if they are software compatible.

c. Patching must be accomplished from HSLA port to device, from port to "term" side of Type A port. A device cannot be disconnected while actively passing data without causing probable software problems within the 355. The issuance of an NC ALL or a TCALL for the channel/device will insure that the device is disconnected prior to removing the patch.

d. The System Supervisor will direct all system patching. The SS also has a current list of all job stream HSLA ports and software compatability.

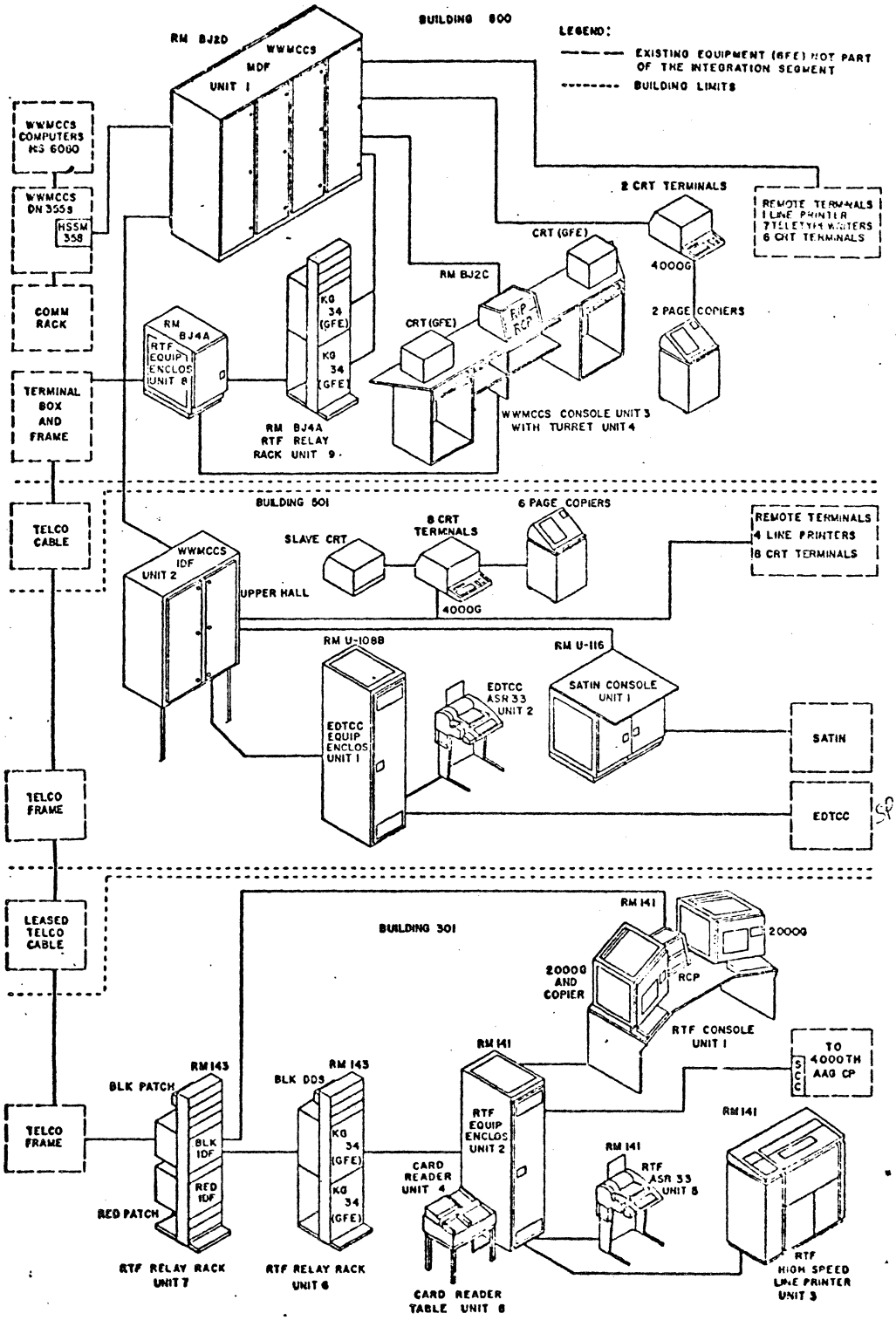


Figure 2-1 Isometric View of 436M Integration Segment

Figure
2-1

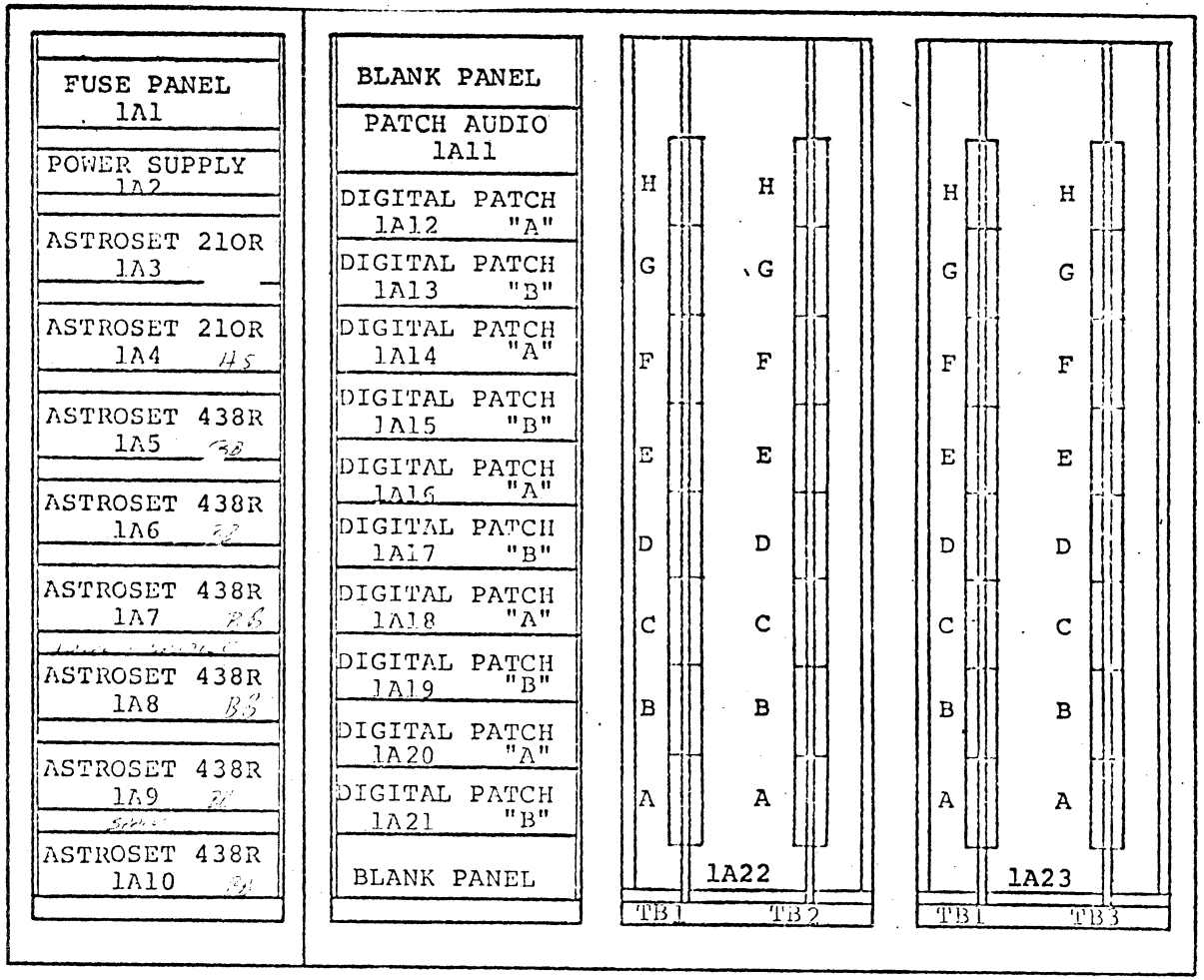


Figure 2-2 Front View of MDF Assembly - Doors Removed

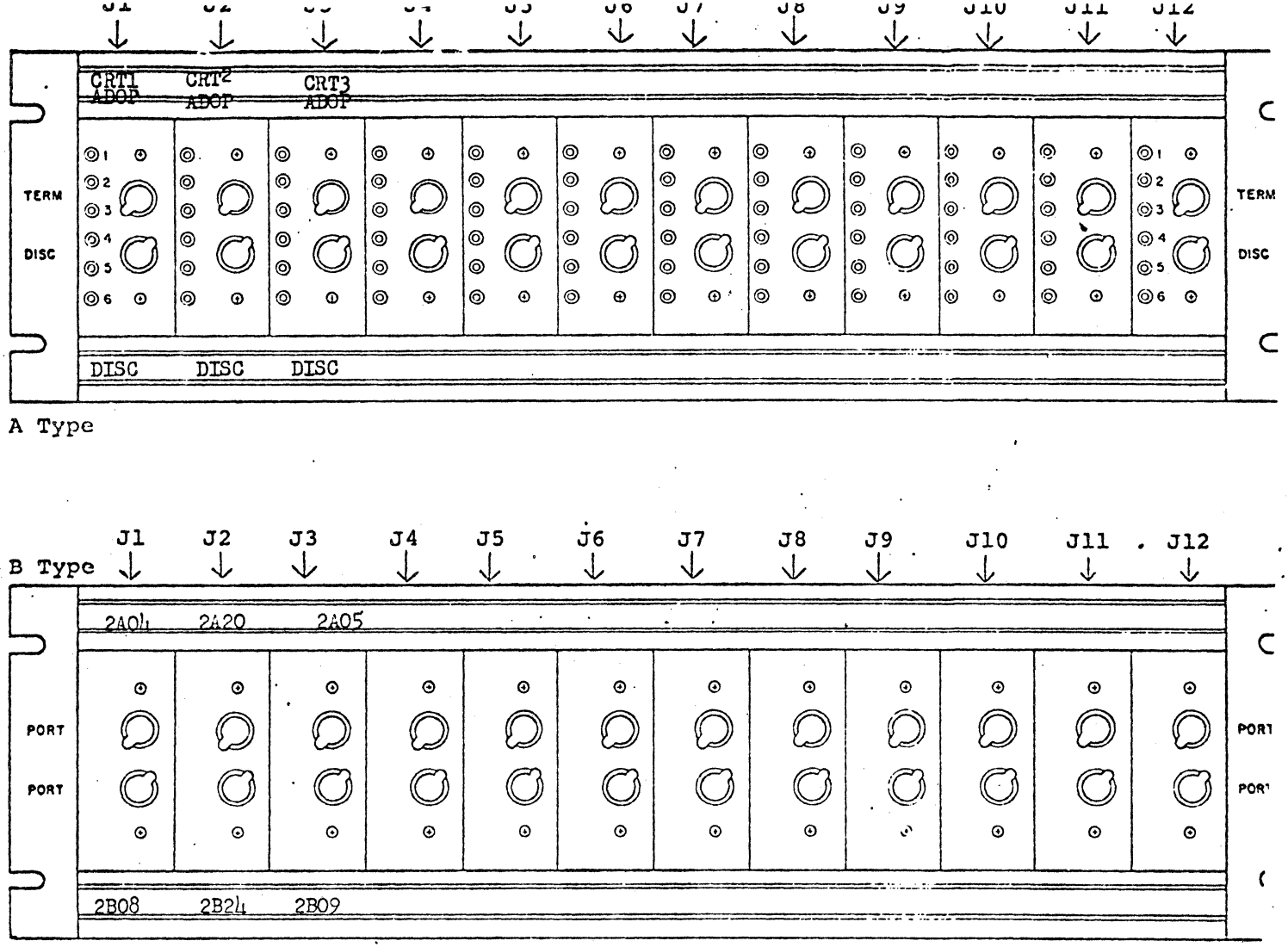


Figure 2-3 Digital Patch Panel

A=DEVICE PORTS

PATCH PANEL IDENTIFICATION

B=HSLA PORTS

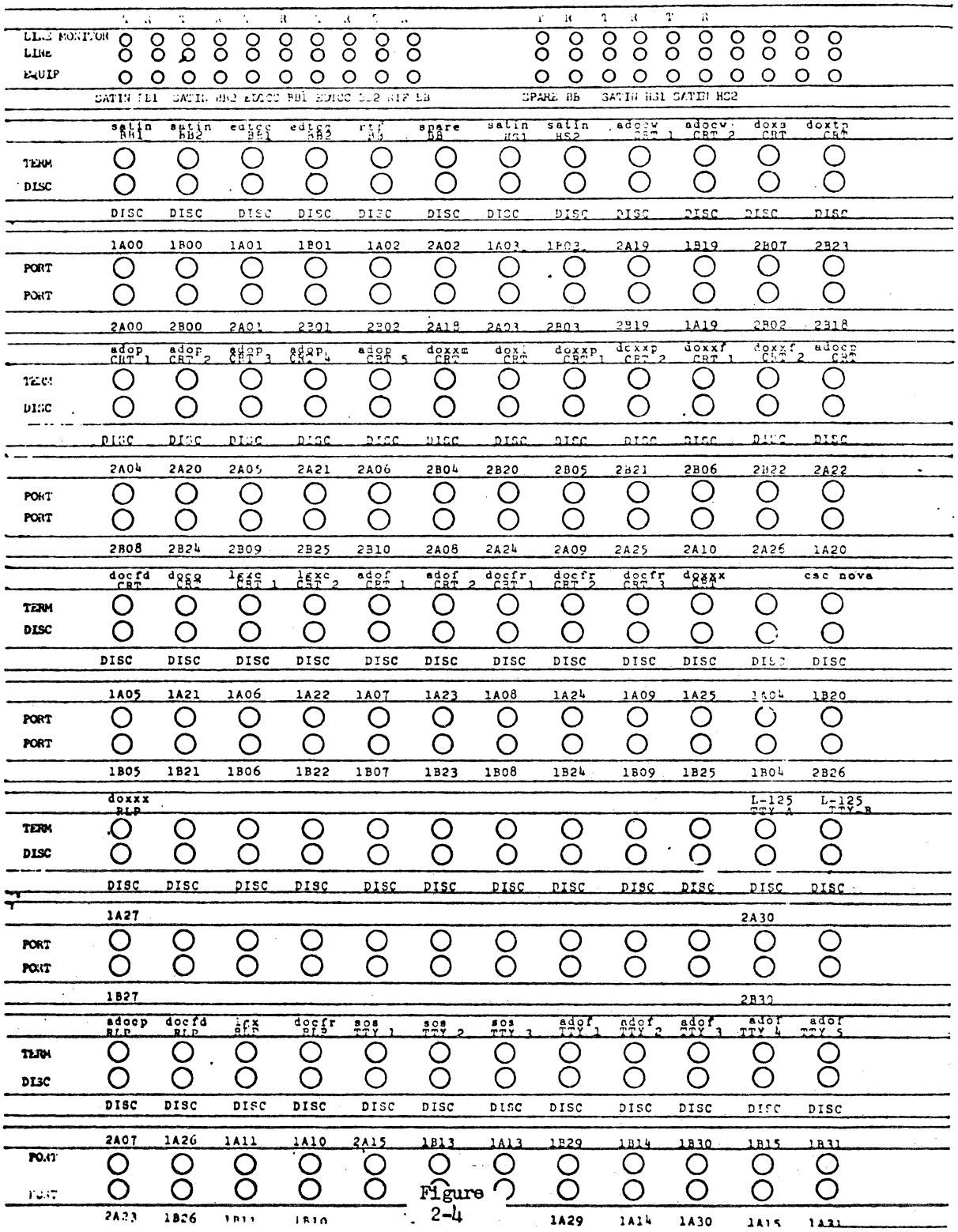


Figure 2-4

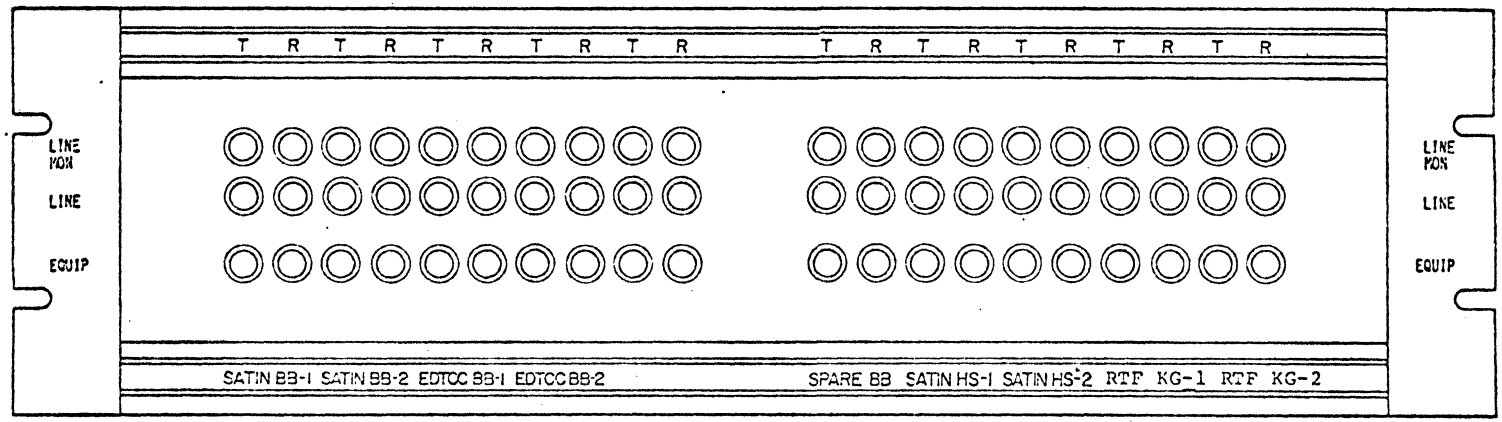


Figure 2-5

Figure 2-5 Audio Patch Panel Front View

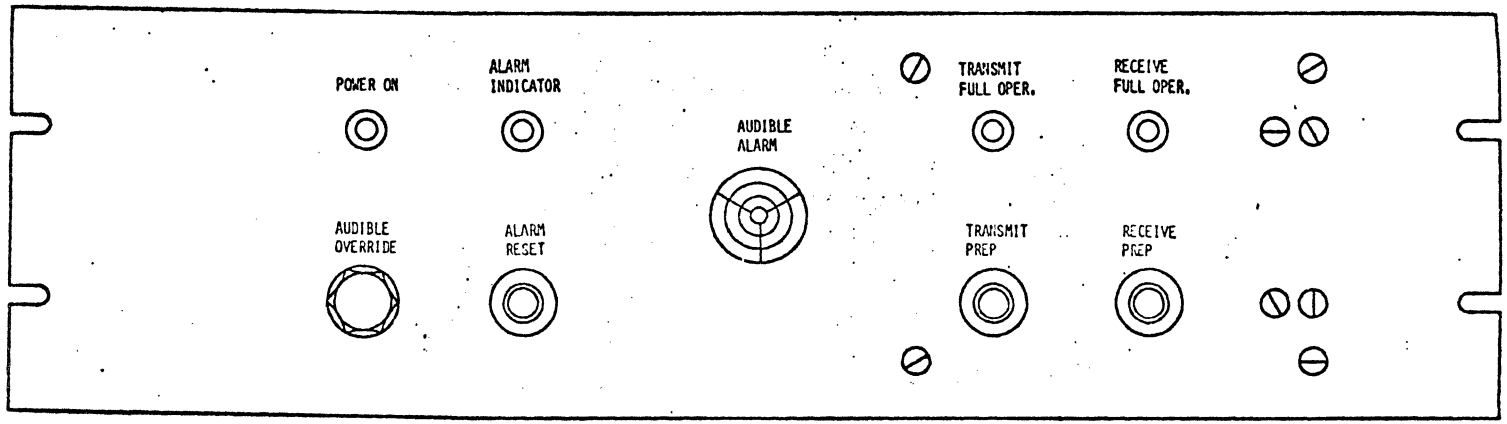


Figure 2-6

REMOTE CONTROL PANEL

FIGURE 2-6

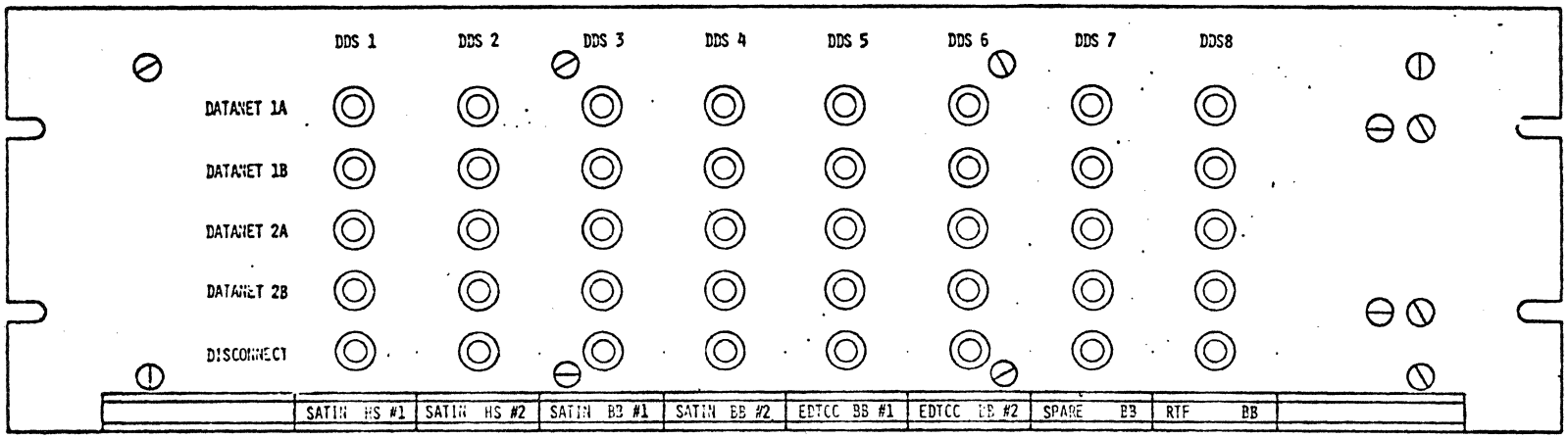
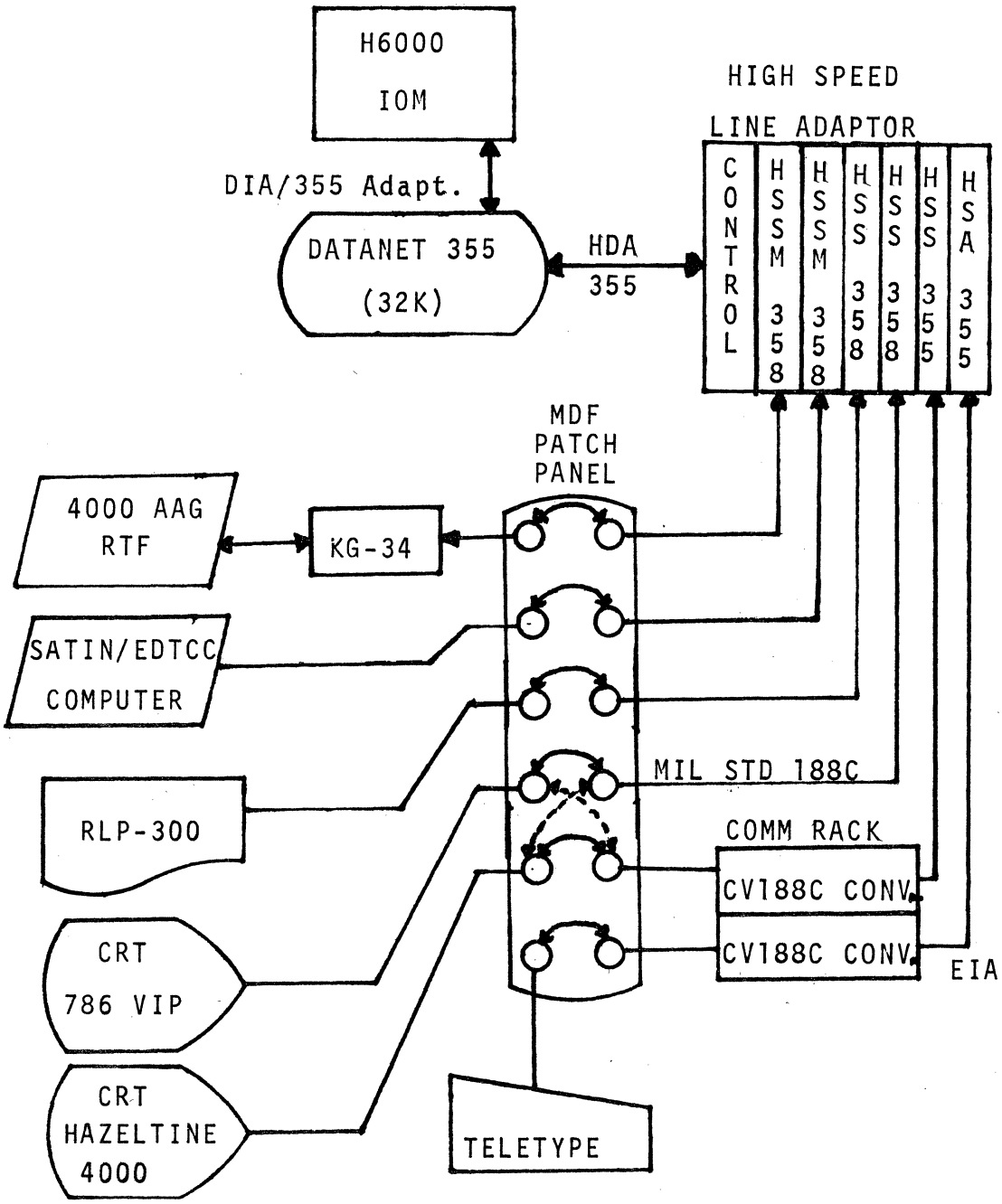


Figure 2-7 Remote Indicator Panel

Figure 2-7

COMMUNICATIONS INTERFACE
(SPB-355 HSLA-355 MDF DEVICE)



BOARD TYPE	HONEYWELL IDENT.	DEVICE COMP.	OUTPUT SIGNAL
F1	HSA 355	TTY/EXECUPORT	RS-232 (EIA)
G2	HSS 355	VIP/HAZ/RLP	RS-232 (EIA)
AL	HSS 358	VIP/HAZ/RLP	MIL STD (188c)
XJ	HSSM 358	REMOTE COM.	MIL STD (188c)

FIGURE 2-8

THIS LIST IS UNCLASSIFIED

RLOAD 01-06-75 20.40 PAGE 1

ORIGIN 73J615 ENTRY LOCATION ENTRY LOCATION ENTRY LOCATION ENTRY LOCATION ENTRY LOCATION

SUBPROGRAMS INCLUDED IN DECK

```
                $       OPTION  SAVE
                $       OPTION  SYMREF,STRTUP
                $       ENTRY   GINT
  0J000 092474  GCCP    00000     .IGCCP 07425
```

CONFIGURATION SECTION

```
                $       SYSTEM  32,1,0,0
                $       GOPT    T&D
                $       GOPT    TRCSIZ/1000
                $       TRACE   065000
                $       IOM     CH-0,CONSOLE,+50
                $       IOM     CH-4,DIA,+54
                $       IOM     CH-6,HSLA-1,1000
                $       IOM     CH-15,TIMER,+51
                $       HSLA-1  SCH-00,RC,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-01,RC,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-03,RC,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-04,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-05,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-06,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-07,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-20,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-21,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-22,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       HSLA-1  SCH-23,VIP,,MODE/SYNC,WIRE/4,LINE/PVT
                $       END
```

```
                $       OPTION  PSPACE/GMAN(1))/                    058356G1AN03615Z6163MAN
  02200 023774  GMAN    02200     DSPQUR 03377      DISPMR 03371      GETBUF 03624      RELBLK 03752
                INVP    02237     MDISP  03241      MSDSP  02351      RNGP   04225      RNGP2  04230
                RELEBF  04223     GETLBF 04241      G3WJT  04575      SNPCW1 04430      WCALL  04346
                MEMOT   03745     NXA    03735      ETRIP  04213      ETEXTD 04222      DEQUER 03507
                DEQURA  03514     DEQURB 03524      RADTB  04347      PRIORI 04643      BCDTB_ 04656
                STRMBF  03605     GTICBF 03514      TS1LD2 03747      DSPTAB 02456      DATTAB 02557
                .IGMAN  03064
        SYMREFS         T.SVX1            TRACE1            TRACE2

                1123    PATCH   233100          DONT INCREMENT CNT    058356G1AN3615Z6163MAN
  05062 022774  GIOM    05070     WSNDSP 05271      INTDIS 05333      GOOICS 05717      ICDVTP 10664
                .IGIOM  10721
```

THIS PRODUCT CONTAINS
UNCLASSIFIED DATA

FIGURE 2-9
2-14

BOOTLOAD DESCRIPTION (355 BOOTDECK)

HIGH SPEED LINE ADAPTOR (HSLA)

SECTION-III

WWMCCS ENVIRONMENTAL CONTROL

SYSTEMS

The purpose of this section is to identify and describe the primary and backup environmental support systems for the Strategic Air Command Central Computer Facility (BJ-WING). The environmental systems presented are, the Avtel Uninterruptable Power System (UPS), Honeywell Motor Generator central system power, the primary air conditioning system with switchable air handling units (AHU), and the Central facility smoke and head detection and warning system.

1. BJ WING ELECTRICAL POWER SUPPLY:

a. Primary Power Source: The BJ wing utilizes commercial power routed through the uninterruptable power system (UPS). UPS is a hardware device that provides constant power to the WWMCCS computer facility.

(1) Commercial power is routed through three UPS modules during the normal mode of operation. The power is stabilized and passed to the central systems without modulation. If UPS sensing switches detect a break or degredation in the commercial power source, internal storage batteries carry the critical load unitl backup diesel power is established. As soon as the commercial break is detected, a starting signal is transmitted from UPS to the backup diesel power facility, and the units begin an automatic startup sequence. UPS monitors the critical load and will automatically switch from battery to diesel source as soon as the backup power is constant. When the commercial source is again available, the UPS module will switch to the primary input source.

(2) The three UPS modules are designed to operate as independant units. Malfunctions can occur within two seperate UPS modules without causing a total UPS failure. The storage batteries contain sufficient power reserve to carry the critical load until back up diesel power can be applied. The batteries automatically recharge when the commercial power source is re-established.

(3) An UPS remote status panel is located within the WWMCCS computer facility to provide a visual and audible indicator for UPS on line performance. Figure 3-1 illustrates the UPS remote status panel and provides an explanation of it's major indicators.

(4) UPS output power is distributed to thirteen power distribution boxes located within the computer facility. Each power box is labeled with a unique identifier as described below:

PS-1-1A
(1) (2) (3)

(1) Identifies the primary power distribution.

PS = Distributes power to peripheral devices , i.e. card readers, punches, line printers, micro-programmable controllers, tape handlers and controllers, consoles, disk file units, and communications devices.

CS= Distributes power to mainframe components, i.e. memory modules, SCU's, IOM's, Processors, 355's.

(2) Identifies Major System supplied:

1= System 1, includes job stream 1A and 1B

2= System II

(3) Identifies a sequential control number for each power box.

(5) Each power distribution box contains thirty individual power circuits, and a master trip bus to control power to the entire panel. All devices vary in power requirements, therefore, power circuits are logically grouped with vertical bus bar trippers for each device serviced. A template is located within each power panel to identify the circuit assignment for each peripheral device served.

(6) Each component served by a CS or PS power panel has a unique tag displayed next to it's control switches to identify the power box, and circuit number from which it obtains it's power source.

b. Alternate Power Source: In the event of UPS failure, two methods of power are available to the WWMCCS facility. The first being direct commercial power supplied directly and the second being diesel power generated by the backup facility. These sources are routed through isolation transformers or Honeywell Motor Generator Sets to the PS/CS power boxes. The isolation transformer method is the least desirable, and will not be presented in this publication.

(1) The Honeywell Motor Generators must be used when direct commercial power or the backup diesel source is used. Although the motor generators are not a power source within themselves, their primary purpose is to smooth power variances between the input line voltage and mainframe devices. The MG sets are loacted in the power bus line between the power source and the CS power panels. Power to the PS panels during alternate modes of operation does not pass through the MG s ets,but feeds directly from imput source to PS pannel.

(2) The MG sets are activated during alternate modes of operation by the use of power sequencers located with the computer facility. The power sequencers for each System (SYSI&SYSII) must be turned on and started prior to receiving power into the CS power panels. A building engineer will be present during all degraded modes of power operation. Engineer's must make many switch changes within the UPS facility prior to using the alternate power source. The engineer will coordinate all activities with the system supervisor during the power switchover. Close coordination is essential, since all H6080 systems must be shut down for all power changes when the UPS system is not on line.

2. BJ WING CLIMATIC ENVIRONMENT CONTROL:

a. The central computer facility utilizes two air conditioning chiller units augmented by three air handling units to distribute the airflow. The environment system uses a blended (Temp/Humidity) 55 degrees forced air flow distributed under the raised floor to all system components. A central monitoring device is located within the facility to monitor air flow, temperature, humidity and provide a permanent record graph for temperature and humidity. (Ref figure 3-2)

(1) A sensing device is located under the raised floor in close proximity to the inlet duct to detect out of tolerance temperature or humidity conditions. An audible alarm sounds and an appropriate indicator is illuminated when the temperature is not between the range of 55-64 degrees and the humidity is not between 40-60%. NOTE: an underfloor temperature of 55-64 degrees must be maintained to keep the above floor temperature under 80 degrees.

(2) A control and monitor unit is located within the facility for the three air handling units. Two of the three units must be on to provide the proper air flow to all components and prevent potential hot spots near high BTU output components. One AHU is always available as a spare. The units are rotated at periodic intervals to equalize utilization and detect malfunctions within the spare unit. (Ref. Figure 3-2)

3. BJ WING SMOKE & HEAT DETECTORS WARNING SYSTEM: Within the computer facility twenty overhead, and twenty underfloor sensors are strategically located to provide visual/audio warning of a potential smoke or fire hazard. A central warning panel is located within the facility to provide visual identification for the device that is activated. The light display uses a floor grid reference number to provide the operator with a method of identifying the location of the hazard. In addition, the detectors are inter-connected to the fire alarm system. Whenever a detector is activated the fire department will respond immediately. Fire department personnel must de-activate the sensors once

they are engaged. These devices are very sensitive to heat and smoke, therefore, it is imperative that personnel do not smoke or use heat generating tools in the vacinity of the sensors.

4. BJ WING HALON FIRE DETECTION AND SUPPRESSION SYSTEM:

a. An upgraded fire detection and suppression system was installed within the BJ wing, October 1974. The H6000 mainframe area, F.E. facility, BJ computer supplies store room, UPS switching facility, and UPS battery room is protected by the System. The system uses a smothering agent to eliminate either electrical or combustion induced fire hazards.

b. The Halon System uses thermal and combustion sensors above and below the floor level of protected areas. The combustion d tectors are used to d tect smoke and fumes of a combustionable nature. The thermal detectors are used to sense abnormal rises in temperature conditions. Either type sensor may activate a Halon alarm, but both types of sensors must be activated to automatically discharge the Halon agent. The agent is discharged via high pressure tanks located within the ceiling and within the sub-floor (H6000 area). The Fire Department is automatically notified whenever a Halon alarm condition occurs.

c. Two seperate panels control the Halon System. Panel A (figures 3-4 & 3-5) controls the computer facility and Panel B controls the UPS switchgear and battery facilities.

d. Operations personnel have the capability to ABORT the discharging of the Halon agent within the H6000 computer facility. The discharging of the Halon agent within the UPS facility cannot be aborted.

e. Figures 3-4 and 3-5 identify the primary controls and logic for panel-A. This is the primary operator interface panel in the event of a HALON malfunction or alarm condition. Reference figures 3-4 and 3-5 with the supplemental information listed below: (NOTE: ref Operations Information Item 2-02C for Shift Supervisor & Team Chief responsibilities)

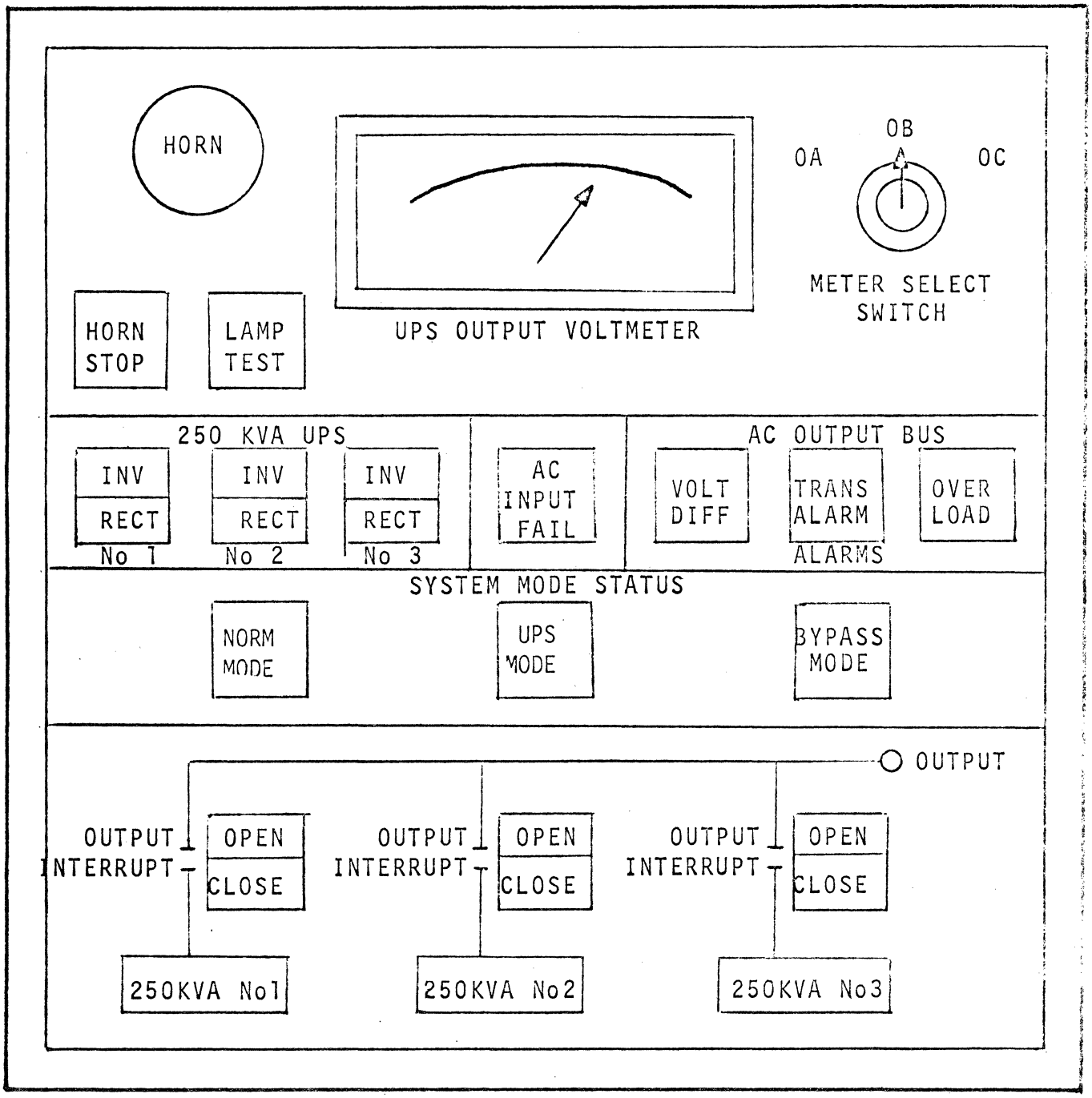
(1) Panel A is divided into two distinct sections. The upper portions provide control switches and the lower portion contains the automatic abort switch, manual pull station, and sensor location indicators.

(2) The abort key (automatic overide) is attached to panel A at all times.

(3) ALL Sensor alarm conditions must be cleared on the upper panel BEFORE the overide switch is deactivated to prevent discharge.

(4) The manual pull station is always active, even with the overide switch engaged.

(5) The System Supervisor has the key to the upper panel. Do not attempt to reset an alarm condition , BEFORE clearing the individual sensor.



REMOTE STATUS PANEL

Figure 3-1

UPS REMOTE STATUS PANEL

A. HORN; Audible alarm which sounds whenever an UPS malfunction or degredation exist.

B. HORN STOP; When depressed disables the audible horn.. illuminated when depressed.

C. LAMP TEST; All indicators are illuminated when depressed.

D. UPS OUTPUT VOLTAGE; Voltmeter for measuring the output voltage to the critical load.

E. VOLTMETER SELECT; Can be switched (3 positions) to measure the three phases of critical load.

F,G,H, INVERTER/RECTIFIER 1,2, OR 3; Will illuminate if either the inverter or rectifier has failed.

I. AC INPUT FAIL; Will illuminate if AC power input lost to UPS system.

J. TRANSFER ALARM; Will illuminate when a voltage tolerance is indicated within the UPS System.

K. VOLTAGE DIFFERENCE; Will illuminate when voltage is different between input and output when passing through the UPS System.

L. OVER LOAD; Will illuminate when an overload exist in one of the UPS systems.

M. UPS MODE; Will illuminate when the UPS system is operatiog on battery power and no input available to the UPS system.

N. NORMAL MODE; Not used for the current UPS configuration.

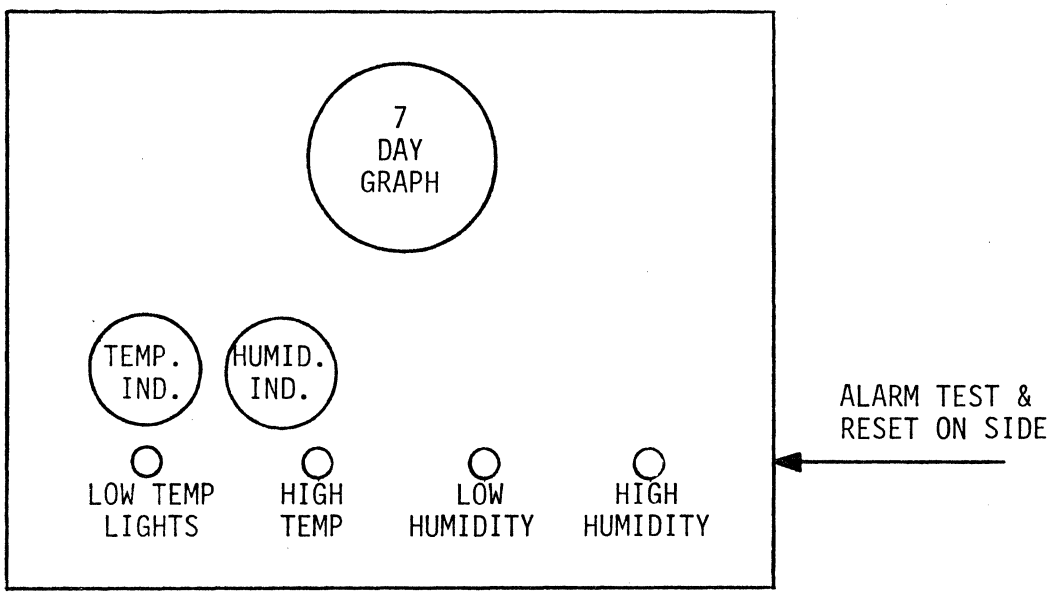
O. BY-PASS MODE; Will be illuminated when commercial or backup power inputs are by-passing the UPS system and are feeding directly into the isolation transformers or the Honeywell Motot Generator sets.

P,Q,R. OUTPUT INTERRUPT MODULES 1,2, and 3; If output interrupt indicates OPEN, module is OFF-LINE. If output interrupt indicates CLOSE, module is ON-LINE (normal).

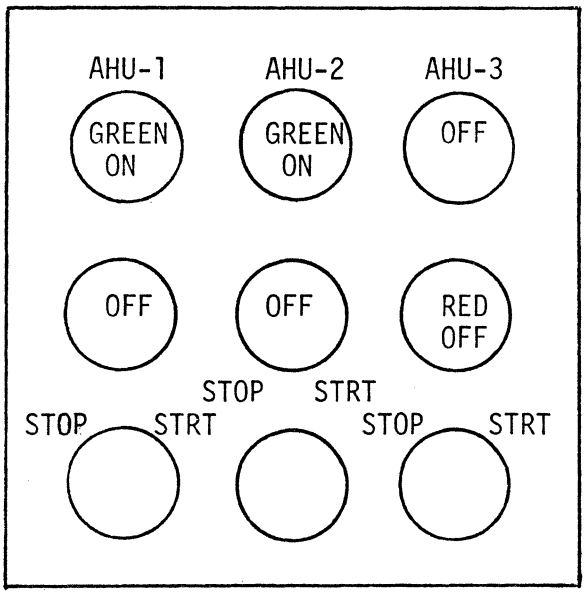
Figure

3-1

AIR CONDITIONING AND AIR HANDLER MONITOR UNITS



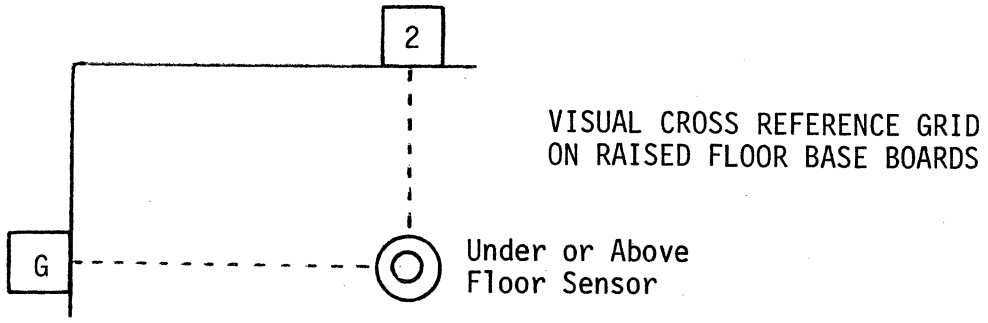
CLIMATIC ENVIRONMENT MONITOR

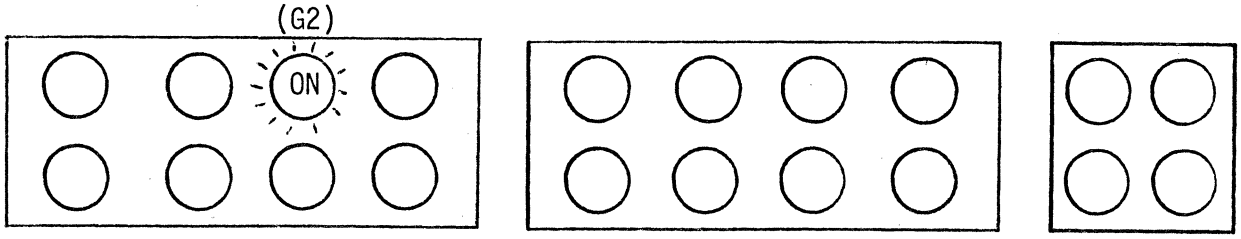


AHU MONITOR UNIT

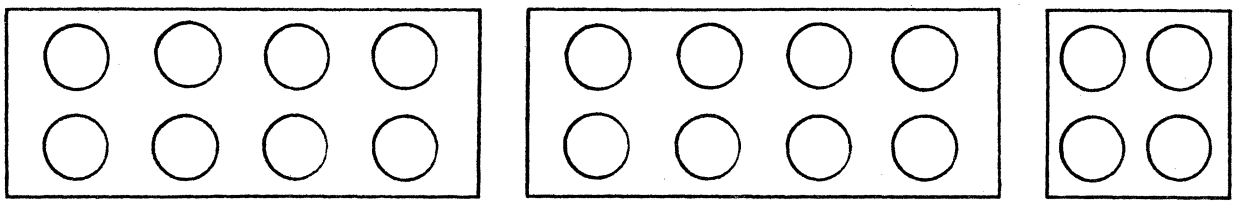
Figure 3-2

HEAT & SMOKE DETECTION WARNING SYSTEM





ABOVE FLOOR DETECTORS

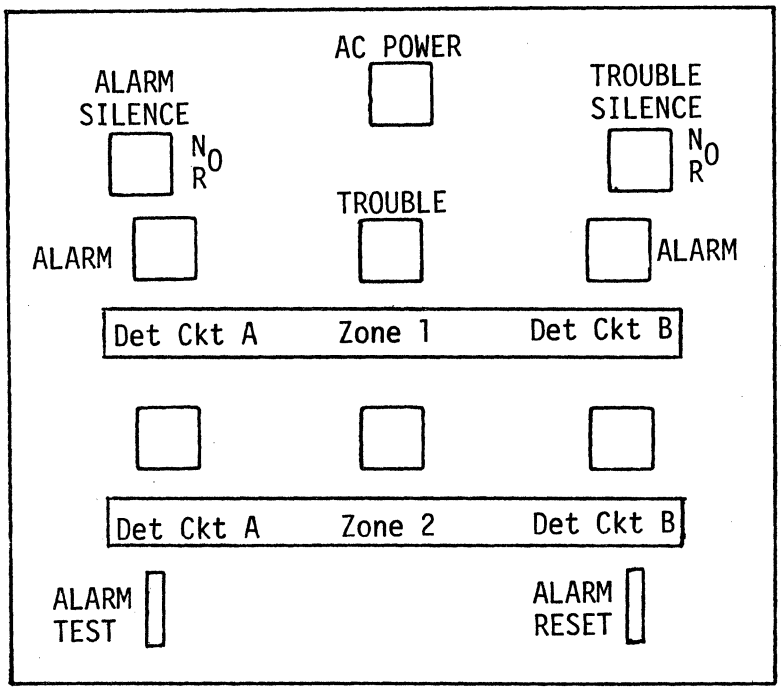


BELOW FLOOR DETECTORS

Figure 3-3

HALON PANEL "A"

(Upper Display Unit)



SWITCH LEGEND

AC POWER: Indicates AC power present to Halon modules.

ALARM SILENCE: Right position NORMAL, left position SILENCES alarms.

TROUBLE SILENCE: Right position NORMAL, left position SILENCES trouble alarms.

ALARM DET. CKT A: If zone 1&2 illuminated, indicates combustion detector is activated. Agent will not discharge with CKT A alarm ONLY.

TROUBLE ALARM: Indicates that the Halon System is in a trouble status, or is operating on internal battery storage power.

ALARM DET. CKT B: If zone 1 or 2 illuminated, indicates thermal detector alarm, or that the Manual Pull station has been activated.

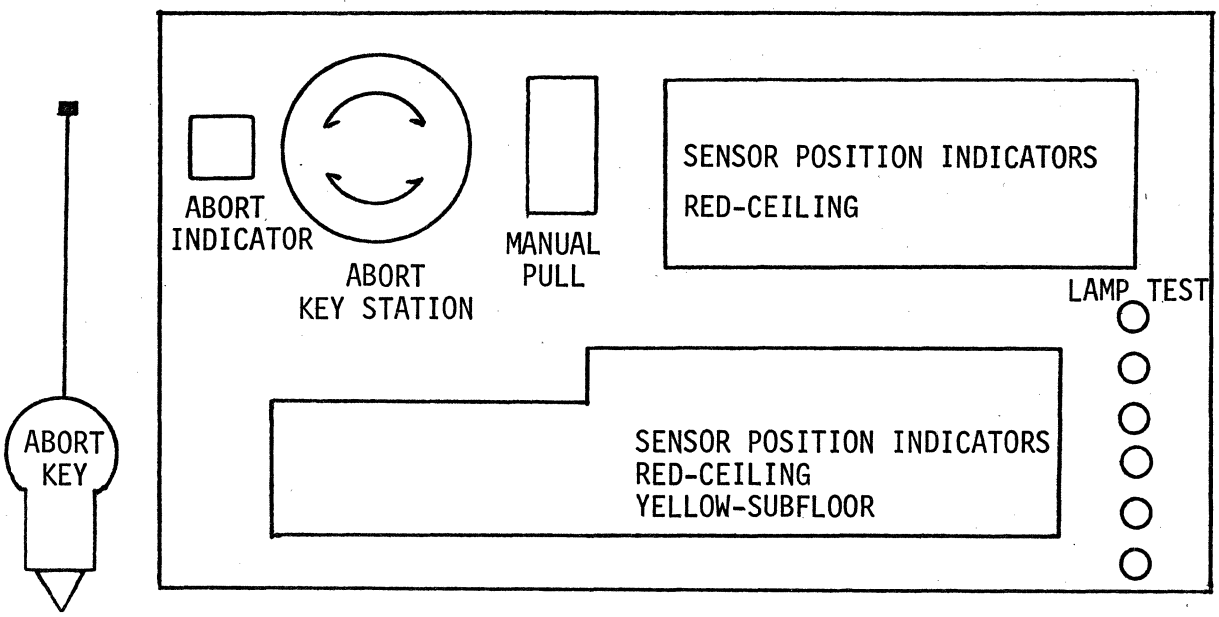
ALARM TEST: When activated, illuminates all alarm indicators and activates all warning bells, INCLUDING the Fire Department Alarm.

ALARM RESET: Resets trouble or alarm conditions on panel. NOTE: The sensor MUST HAVE CLEARED (thermal & combustion) before indicators will reset.

FIGURE 3-4

HALON PANEL "A"

(Lower Display Unit)



SWITCH LEGEND

ABORT KEY:	Must be inserted in the abort key station, to abort Halon discharge.
ABORT INDICATOR:	Yellow indicator, when illuminated signifies that the Halon system will not automatically discharge the Halon Agent.
MANUAL PULL:	Allows manual discharge of the Halon system, regardless of panel indicators, abort key position, etc. System will dump agent within 45 seconds, cannot be reversed.
SENSOR POSITION INDICATORS:	When activated, shows the floor position of the activated sensor. Red-Ceiling, Yellow-Subfloor. Sensors are for combustion detectors only.
LAMP TEST:	Activates sensor indicators, there are separate lamp test indicators for Zone, and above & below floor detectors.

Figure 3-5

SECTION - II

WWMCCS AUGMENTED HARDWARE COMPONENTS (436M)

1. The 436M integration segment provides interconnection and integration between WWMCCS systems 1A &1B and II, and the following systems and facilities.

a. SAC automated total information network (SATIN).

b. Electronic Data Transmission Communication Central (EDTCC).

c. The 4000 Aerospace Applications Group (AAG) Command Processor (CP) and Remote Terminal Facility (RTF).

d. The following remote terminal devices are interconnected via the 436M integration segment.

(1) Crt's, Hazeltine 4000 and Honeywell 786/VIP.

(2) Page copiers PRTR 800 BH, and VIP 786W-3.

(3) Slave CRT's, CRT TD23M.

(4) Teletypes, ITT-KSR35, and Honeywell KSR33.

(5) Lineprinters, Mohawk, Honeywell-RLP/3000

2. The primary purpose for the integration segment is to provide interface equipment to allow WWMCCS to assume on-line force control functions through a communications interface to SATIN and EDTCC. Additionally 436M will provide quick response, computational support to the 4000 AAG.

3. The primary interface to the WWMCCS 6000 computer is through the three data-net 355 front-end communications processors. Each data-net on systems 1A/1B is connected to a single High Speed Line Adaptor (HSLA). System II's data-net is connected to dual High Speed Line Adaptors. Each of these HSLA's is equipped to provide up to 32 input/output sub channels. A detailed explanation of 355 HSLA channel types and software configurations will be presented in para. 5, this section.

4. 436M Major Components: (ref figure 2-1)